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A REVISION OF THE GENUS *ERECHTITES* (COMPOSITAE), WITH INQUIRIES INTO *SENECIO* AND *ARRHENECHTHITES* *

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Introduction

This paper is an outgrowth of a study of the botanical collection of the United States of America Typhus Commission, India-Burma Field Party, which collection is now part of the U. S. National Herbarium. It was made by the author and others from June to November, 1945, in the vicinity of Ledo, Assam, and Myitkyina, Burma, mostly from the immediate environs of military camp-sites as part of an investigation of the epidemiology of severe outbreaks of scrub typhus in those areas.

Although a preliminary report of the botanical studies was made to the Commission in 1946, it was never published and the final evaluation of the role of plants in these epidemics has been deferred pending more accurate identification of the species involved. This has been much more difficult than anticipated, because there is no adequate modern floristic treatment of the area from which the plants came.

A further complication has been the unsatisfactory nomenclatural status of many of the species which fall into the category of so-called pantropical weeds and are regarded by many botanists as too well known and widespread to be worthy of serious consideration. Detailed examination of several such "species" has led to the conviction that such weedy genera are quite generally in need of critical review.

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Much of the examination of herbarium material was carried out during the academic year 1951-52, when the author was a Fulbright scholar at Bedford College, London, and the Royal Botanic Gardens, Kew. An account of the rich experiences of that year was published in 1953 (Asa Gray Bull. n.s. 2:13-16).

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The present paper deals with a complex of genera centered around the genus *Erechtites* Raf. in the subtribe SENECIONINAE of the Compositae.

The Compositae are represented in the weedy flora of the tropics by numerous species, among them *Erechtites hieracifolia* Raf. *ex* DC. The fact that numerous specimens of the African *Crassocephalum crepidioides* (Benth.) S. Moore in the U. S. A. T. C. collection were originally determined as *Erechtites hieracifolia* led to the discovery that most Asiatic specimens were in fact wrongly determined as the latter species in the major herbaria studied. An effort to clarify the status of these two species in the weed flora led to a critical study of the genus *Erechtites* in the New and Old World. An attempt was made to locate and compare type material for every binominal published in the genus, and to collate the major treatments of the genus. This revision has also necessitated inquiries into related genera, notably *Senecio* L., *Arrhenechthites* Mattf., *Crassocephalum* Moench and *Gynura* Cass. The status of the latter two genera was discussed by me in a recent paper[1].

ERECHTITES

HISTORY OF THE GENUS

Erechtites was originally published by Rafinesque[2] in 1817, based on an unnamed plant described by C. C. Robin,[3] and it contained one species, *E. prealta* Raf. Sprengel[4] in 1826 in effect reduced the genus to *Senecio* by reducing the species to S. *hieracifolius L.* Cassini[5] in 1827 placed *Erechtites* Raf. in section OTHONNÉES of the SENECIONEAE, with "péricline uniserie, tres-simple, nu à la base", because of Rafinesque's description: "Perianthus . . . denudatus . . . perianthe neither caliculate nor sphacelate". Cassini had earlier (in 1820 and 1825) based the well-defined genus *Neoceis* on *Senecio hieracifolius* L.

In 1831 Lessing[6] identified a Schiede and Deppe specimen as "*Erechthites praealta*", and cited "*Senecio hieracifolius* L." and "*Sonchus agrestis* Sw. fl. ind. occ.!" as synonyms. In 1832 he published[7] a thoroughly revised diagnosis for "*Erechthites* Raf.", in which the distinctive characters, including the appendaged style-arm apex, are clearly brought out, and reduced *Neoceis* Cass. to synonymy. He recognized two species, *E. praealta* Raf. and *E. cacalioides* (Fisch.) Less.

De Candolle[8] in 1838 published "*Erechtites* Raf. fl. ludov. (excl. car.)", with a diagnosis much more resembling Lessing's and Cassini's than that by Rafinesque. *Neoceis* became a section of *Erechtites* containing six species from the Americas. Three new sections were added by de Candolle to receive a total of thir-

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[1] Kew Bull. 1955:455–465.
[2] Florula Ludoviciana. p. 65.
[3] Voyages dans l' intérieur de la Louisiane et de la Floride occidentale, et dans les isles de la Martinique et de Saint Dominique pendant les années 1802, 1803, 1804, 1805, et 1806. Vol. III. Flore Louisiane. p. 435. 1807.
[4] Caroli Linnaei Syst. Veg. ed 16, 3:565. 1826.
[5] Dict. Sci. Nat. 48:446-466. 1827.
[6] Linnaea 6:411. 1831.
[7] Syn. Gen. Comp. 395. 1832.
[8] Prodr. 6:295. 1838.

teen species from Australasia, including two treated by Cassini under *Neoceis* and a number previously published as *Senecio*.

It is significant that although botanists in general, other than Schultz Bipontinus and Mueller, have not openly questioned de Candolle's treatment of *Erechtites*, de Candolle himself included in the diagnosis of each of the three Australasian sections a query as to the propriety of including it in *Erechtites!* Those doubts were fully justified. The indigenous Australasian and Indonesian species must be excluded from the genus *Erechtites* as here defined.

Comparison of the types and other material of the American species with those of the Old World has led to the conviction that they are not really congeneric, just as de Candolle suspected. The American species, with the exception of two which clearly are discoid species of *Senecio*, agree in having the style-arm apex prolonged into a tuft of fused papillose hairs, which is quite similar to the somewhat longer appendage that helps to characterize *Crassocephalum*. The native Old World species, with the exceptions noted below, all agree in having the style-arm apex bluntly truncated or rounded, and nude or with a marginal fringe of diverging papillae; that is, indistinguishable from the style-arm apex characterizing the genus *Senecio*. The American material is heterogamous. Within the Australasian material occurs every degree of transition from the outer two rows of florets pistillate and filiform to all florets perfect and infundibuliform, or to outer florets ligulate and pistillate; in other words, there is intergradation without a break into both the discoid and the radiate groups of *Senecio*.

The name *Erechtites* was first applied to and must be typified by American material. Therefore the non-congeneric Old World species must receive another name. In the absence of any clear-cut distinction between the majority of these species and other Australasian species which have universally been referred to *Senecio*, I have transferred them, except for six species, to that genus, to which, indeed, most of them were originally ascribed. The only alternative to broadening somewhat the limits of *Senecio* is to set up a new and ill-defined segregate, necessarily impossible of separation except on minute, arbitrary, and unreliable features, a course which I reject.

The return of *all* species of *Erechtites* to *Senecio* has twice been briefly advocated. Schultz Bipontinus[9] found in a specimen of his *Senecio flavus* (S. *Decaisnei* DC.) from the Canary Islands some slender non-ligulate pistillate marginal florets. On the mistaken assumption that the sole difference between *Erechtites* and *Senecio* was in the filiform pistillate marginal florets of the former, he swept all the species of *Erechtites* and of certain other related genera back into *Senecio*. Yet his figure of S. *flavus* in Barker-Webb and Berthelot's Flora of the Canary Islands[10] clearly shows the style arm bluntly truncated with a corona of divergent hairs, indicating that it is a *Senecio* and not an *Erechtites!* Furthermore, two of the three otherwise identical specimens of S. *Decaisnei* in the Prodromus Herbarium,

[9] Flora 28:497-498. 1845.
[10] Hist. Nat. Iles Canaries 2:319. *t.* 107. 1836-50.

duplicates of those cited by Schultz, have *ligulate* marginal florets whereas the third does not, and all have senecionoid style arms.

A somewhat similar position was taken independently by Baron Ferdinand von Mueller[11] at one time for the Australasian species of *Erechtites*. He listed nineteen species of *Senecio* under cultivation in the Melbourne Botanic Garden, of which two, *S. hispidulus* A. Rich. and *S. quadridentatus* Labill., were revived names for species which both earlier and later he treated in *Erechtites*. His argument was presented by Bentham[12]: "F. Mueller proposes to unite the two genera *Erechthites* and *Senecio* on account of those supposed intermediate species forming de Candolle's section *Plagiotome*". Bentham rejected this view, and Mueller resumed use of the name *Erechtites*. But later[13], in describing *Senecio haplogynus* from New Guinea, he stated:

> "Bentham and J. Hooker observed already (Gen. Plant. II. 208), that occasionally some thin solely pistillate flowers occur in species of *Senecio;* hence the only characteristic which separates *Erechtites* from that genus is unreliable, and therefore the present plant may be placed in either genus."

This applied to the Australasian material, but overlooked the nature of the style-arm apex which further distinguishes the American species.

Exceptions to this reduction of Old World species to *Senecio* are the six species to be referred, one for the first time, to *Arrhenechthites* Mattf. These species, including *Senecio haplogynus*, are well distinguished from *Senecio*, *Erechtites*, *Crassocephalum*, and *Gynura* by their functionally staminate center florets with short style arms which are densely papillose on their outer faces and are not appendaged. The range of *Arrhenechthites*, formerly known only from the mountains of New Guinea, now includes the Blue Mountains of southeastern Australia.

All this leads to the problem in the Candollean treatment of *Erechtites* posed by Merrill:[14]

> "This generic name has been accepted by all authors, and yet it is rather curious to note that Candolle, Prodr. 6: 294. 1838, in his full description of the genus, states '*Erechtites* Rafin. fl. ludov. (1817 p. 65 (excl. char.)'. This probably should be interpreted to mean char. emend., as, *ex descr.*, the type *E. prealta* Raf. is now placed as a variety of *E. hieracifolia* (Linn.) Raf. *ex* DC."

In undertaking the compilation of the 'Prodromus', de Candolle had solicited specimens from all and sundry, promising to give full credit for either specimens or names. The scrupulousness with which he carried out this promise is a challenge to his successors and a reproach to more than one. But in this case it led him into difficulties. There is clear evidence in the Prodromus Herbarium that de Candolle originally considered the American species which he finally placed in *Erechtites* to belong to *Neoceis* Cass. This name in his writing appears repeatedly

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[11] Catalogue of plants under cultivation in the Melbourne Botanical Garden, October, 1858, in General Report of the Government Botanist for 1858. p. 26. 1859—This is the Cat. Hort. Melb. cited by Bentham (Fl. Austral. 3:659) for *Senecio Lessonii* F. Muell.

[12] Fl. Austral. 3:659. 1866.

[13] Trans. Roy. Soc. Victoria 1^2:14-15. 1889.

[14] Index Rafinesquianus, p. 235. 1949.

on the sheets of the first six species. In some instances there is no other generic designation except on the outside label of the cover, which of course was collated to agree with the published text of the 'Prodromus.' He probably also accepted Cassini's relegation of the faultily drawn *Erechtites* Raf. to section OTHONNÉES.

This nicely settled state of affairs was rudely upset in 1830 by a letter from Rafinesque, in which he placed S. *hieracifolius* in a new subgenus. This note, of crucial importance in evaluating both Rafinesque's and de Candolle's interpretations of *Erechtites*, is reproduced here for the first time. It is found in a lengthy folio letter entitled: "Serie de Lettres Botaniques addressées au Prof. Decandolle de Genève, par le Prof. Rafinesque de Philadelphie. N. 5. Octobre 1830 philadelphie," and preserved in the library of the Conservatoire de Botanique, Genève. The writing has faded somewhat, so that some words were only doubtfully deciphered. These are identified by bracketed queries or reconstructions. I am greatly indebted to Dr. Charles Baehni, Director of the Conservatoire, for locating the letter for me, to him and Dr. C. E. B. Bonner for help in transcribing the passage in question, and to Prof. H. H. Bartlett for suggestions on deciphering it. It appears to read as follows:

"13. *Senecio* L. Il faut restituer le G. [genus] *Jacobea* T. pour less S. radiés, nos Esp. [species] ont les rayons 3 dentiformi[bu]s [?, dentiformes?] S. balsamita rayons 3 fids, S. G.??—Les vrais *Senecio* flosc. nos 3 Esp. *hieracifolius*, prealtus Raf. fl. lud. & elongatus P. formant mon S. G. [subgenus] Erechtites (fait Gen. fl. lud) Per. fol. ovalitis [?, ovatis? ovalibus?] vix calic.-flosc. fem. vix radiis [?, radiatis ?] filiformi[bu]s vix 5 dentatis."

The intention here seems clear enough. The radiate species of *Senecio* are to be returned to *Jacobea* Tourn. (this is an old and recurrent argument), with S. *balsamitae* perhaps the type of a subgenus on account of its trifid rays. The true (i.e., discoid) species of *Senecio* in the United States are sufficiently distinct from the Old World species (as exemplified by S. *vulgaris*) to be placed in a separate subgenus containing three species. This subgenus *Erechtites* of the genus *Senecio* as here redefined is so changed from the 1817 version as to be scarcely recognizable. Formerly it was ecalyculate, with florets hermaphroditic; now it is scarcely calyculate, with feminine florets filiform. That it is still applied to the same material as was the original genus *Erechtites* is supported not only by his explicit reference to its former status but also by the change of gender of the original specific epithet to agree with the new generic name.

This letter, in my opinion, is the one referred to by de Candolle [15] in a footnote: "Cl. Rafinesque in litt. 1832 [i. e., 1830] forte non immerito distinguit Erechtites sp. 3, nempe hieracifolia, praealta fl. lud. et elongata, sed descriptiones nullas edidit." The letter would seem to be the authority for the new combination, "Erechtites hieracifolia (Raf. in litt.)". That Rafinesque distinguished three species of *Erechtites;* namely, *hieracifolia, praealta,* and *elongata,* at least in the 1830 letter, is scarcely accurate. What he actually did was to designate three discoid species which he regarded as together forming a subgenus of *Senecio.* That he

[15] Prodr. 6:294. 1838.

wrote nothing of their descriptions was but natural, since all three had been described previously, by Linnaeus, by Rafinesque (as *Erechtites prealta*), and by Pursh, respectively.

Now that Rafinesque had identified his genus with *S. hieracifolius* as a subgenus of *Senecio*, the revised diagnosis, while still leaving much to be desired, was recognizable as applying to the Linnaean species. I believe that de Candolle wished: (a) to maintain *Erechtites* (*Neoceis*) as a genus, rather than a subgenus; (b) to accept *Erechtites in sensu* 1830 rather than 1817; and (c) to credit the name to the original author. But the *Erechtites* of 1830 was unpublished. De Candolle's solution was to adopt the earlier and validly published name but to exclude the faulty diagnosis, substituting for it a new one based on that of the now superfluous *Neoceis* Cass., which he demoted to a section. I believe de Candolle meant "*Erechtites* Rafin . . . (excl. car.)" literally, and with justification. About the only feature in common between his diagnosis and the one published by Rafinesque is that in both the heads are described as multiflorous!

Early references to *Erechtites* in floristic works for North America were erratic. W. J. Hooker in 1834 and Darlington in 1837 both cited "*Erecthites* [sic!] *praealta* Raf.—Less." as a synonym of *S. hieracifolius*, which Darlington, however, correctly described as having "heads discoid, branches of the style conic at the apex". Torrey and Gray in 1845 took up the Candollean treatment of *Erechtites*, with "*E. hieracifolia* (Raf.)" the only species. Darlington in 1853 gave "*Erechtites* Rafin.", but followed his own and other previous treatments in describing the capitula as discoid but the "florets all fertile".

Grisebach, who, in 1861, was first to bring both the temperate and the tropical forms of *E. hieracifolia* together under one specific epithet, gave in his generic diagnosis an accurate characterization of the two types of florets in the capitulum. His description of the style branches as conical at the summit would restrict the coverage to the American species only, and indeed he did not mention the many Australasian species added by de Candolle and others.

Baker in the 'Flora Brasiliensis', in 1884, gave a generic description in many respects excellent, but unfortunately maintained the genus in the extended sense, with "styli rami elongati apice truncati vel obtusissimi". He adduced several new synonyms for *E. hieracifolia*, maintained Grisebach's varieties, but with new diagnoses, and described a new species, *E. ignobilis*, as well as treating *E. valerianaefolia*. Gardner had earlier (in 1845 and 1848) described new species of *Erechtites* and of *Senecio* from his Brazilian collections without defining the generic limits explicitly. His two species of *Erechtites* were later reduced, one to a variety, the other to synonymy.

Fernald in 1917 described *E. megalocarpa* from Cape Cod, and at the same time revised *Erechtites* in temperate North America, establishing three varieties of *E. hieracifolia*. Cronquist in 1946 reduced *E. megalocarpa* to a variety of *E. hieracifolia*, a change not recognized by Fernald. Standley and Steyermark in 1947

published without comment *E. agrestis* (Sw.) as a new combination for *E. cacalioides* Less.

In the southern hemisphere, meanwhile, Malme in 1899 described *E. missionum* from northern Argentina, to which Chodat and Hassler soon added a var. *lanceolata*. Cabrera recently transferred *Senecio leptanthus* Phil., S. *goyazensis* Gardn., and S. *valerianaefolius* Gardn. to *Erechtites*.

Thus, since 1838 numerous new species have been described as *Erechtites*, but without critical review of the whole genus. During this time considerable confusion has developed in the application of names, circumscription of species, and delimitation of the genus. As a further complication, there is evidence of introgression among certain of the supposed species, the extent of which can only be determined by field and laboratory studies yet to be made.

The search for typifying material was mostly successful, although a few critical specimens are apparently lost. The lack of a type for *E. prealta* Raf. posed a major problem. The many Australasian sheets in Kew Herbarium which were annotated by Hooker, or Bentham, or both, in the preparation of their treatments of this group, were gone over carefully, and every effort was made to collate them with the types, particularly of A. Richard and de Candolle. Several misapplications of names and erroneous circumscriptions which have passed from the works of Hooker and of Bentham very generally into the taxonomic literature of Australasia have thus been detected and corrected. Numerous other adjustments in the nomenclature of this long-neglected group have had to be made.

The proper spelling of the generic name has long been debated. Rafinesque states that the name "*Erechtites*" was "one of those given by Dioscorides to the *Senecio*". But the spelling used by Dioscorides in the 'Materia Medica' was "ερεχθίτις" and the arguments by Bentham[16] and Hegi[17] for using "*Erechthites*" are perfectly valid. Under the International Rules a case could be made for correcting Rafinesque's spelling as an unintentional orthographic error. If the genus were to be maintained in the extended Candollean sense, then the Benthamian spelling, widely adopted in works on Australasian botany, might well be retained. But since the genus should be restricted to the American species, it seems better to retain the original spelling of Rafinesque, used by most American authors, the 'Index Kewensis' and the Gray Herbarium Index, and Dalla Torre and Harms.

CONDENSED KEY TO THE SENECIONINAE

The tribe SENECIONEAE may be characterized as having no latex, corollas of the disc florets actinomorphic, anthers ecaudate, pappus capillary (or rarely setaceous), and style arms usually with a crown of diverging pollen-presentation hairs near the truncated, obtuse, or papillose-appendaged apex (but not in *Ligularia*,

[16] Fl. Austral. 3:657. 1866.
[17] Ill. Fl. Mittel Europa 6^2:701. 1929.

Homogyne, Gynura, Cacalia (*Adenostyles*), *Psacalium*).

The subtribe SENECIONINAE O. Hoffm. is further distinguished by having the phyllaries free or very nearly so, and the involucre uni-or biseriate, or if pluriseriate then with the style arms of the perfect florets truncated and penicillate or with a distinct crown of longer hairs.

The following key is based on that given by Hoffman,[18] but has been somewhat condensed and extensively modified to accommodate the following groups: *Arrhenechthites* Mattf.; *Crassocephalum* Moench confused with *Gynura* by Hoffman; certain erechthitoid species of *Senecio*, considered by him as included in *Erechtites*; and four genera revived by Rydberg[19] for the North American species commonly referred to *Cacalia*: *Psacalium* Cass., *Pericalia* Cass., *Mesadenia* Raf., and *Odontotrichum* Zucc. emend. Rydb.

KEY TO THE SENECIONINAE

A. Receptacle with paleae ..... *Schistocarpha, Neurolaena* (cf. *Dubautia* spp.)

AA. Receptacle without paleae ..... B

B. Disc florets sterile C

C. Capitula not all alike in floral composition, plants being more or less dioecious or polygamous ..... *Petasites, Robinsonia, Rhetinodendron*

CC. Capitula all alike in floral composition, plants being neither dioecious nor polygamous ..... D

D. Herbs with leaves radical or decurrent ..... E

E. Perennial sticky-haired herbs with decurrent leaves ..... *Nannoglottis*

EE. Herbs with leaves radical; scapose stems beset with scale-like leaves ..... *Tussilago*

DD. Undershrubs or perennial herbs with cauline leaves well developed, not decurrent ..... F

F. Glabrous undershrubs; leaves somewhat fleshy ..... *Hertia*

FF. Pubescent perennials; shoots herbaceous or suffruticose; leaves not fleshy ..... ARRHENECHTHITES

BB. Disc florets fertile ..... G

G. Capitula with disc florets perfect; marginal florets pistillate, with corolla tubular, filiform, or irregularly split, not ligulate ..... H

H. Leaves radical, cauline leaves scale-like ..... *Homogyne, Stilpnogyne*

HH. Leaves cauline, not scale-like I

I. Leaves entire, thickly crowded; branches leafy to base of capitulum ..... *Erothrix Melalema*

II. Leaves more or less toothed or divided, scattered, reduced to bracts in the inflorescence ..... J

J. Pistillate florets tubular, 4-fid; shrubs ..... *Faujasia*

JJ. Pistillate florets filiform ..... K

K. Style arm with crown of divergent hairs surrounding appendage of fused papillose hairs ..... ERECHTITES

KK. Style arm with crown of divergent hairs but truncated or bluntly rounded, not appendaged ..... erechthitoid species of SENECIO

GG. Capitula discoid with all florets perfect and nonligulate; or radiate, with marginal florets pistillate and ligulate or (rarely) bilabiate L

L. Pappus setaceous ..... *Raillardella* (cf. *Dubautia and Raillardia*)

LL. Pappus capillary ..... M

M. Phyllaries 3- to many-seriate ..... *Alciope, Culcitium, Lepidospartum*

MM. Phyllaries 1- or 2-, rarely 3-seriate, often 1-seriate, with shorter calyculus ..... N

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[18] Hoffman, O., in Engl. & Prantl's Die Nat. Pflanzenfam IV[5]:286-289. 1894.

[19] Bull. Torr. Bot. Club 51: 369–378, 409–420. 1924.

N. Leaves opposite, or only the uppermost alternate .....*Mallotopus, Haploesthes, Arnica, Gynoxys*

NN. Leaves alternate or radical .....O

O. Receptacle hemispherical, conical, strongly arched, or flat with the center produced in a conical prolongation .....P

P. Capitula radiate, receptacle various but not flat and without central cone .....*Crocidium, Bartlettia, Doronicum*

PP. Capitula discoid, receptacle flat, with center produced in a conical prolongation; corolla white or whitish, with distinct campanulate throat and long lobes; achene terete, oblong .....*Mesadenia* (*Cacalia* § *Conophora* DC.)

OO. Receptacle flat .....Q

Q. Phyllaries with leaf-like appendage along midrib .....*Lopholaema*

QQ. Phyllaries without leaf-like appendages .....R

R. Capitula radiate .....S

S. Marginal florets bilabiate, inner lip short, outer strap-like..... *Brachyglottis*

SS. Marginal florets ligulate, without inner lip, ligule entire or 2- to 3-dentate .....T

T. Achene dorsally compressed .....*Cineraria*

TT. Achene not compressed but prismatic or cylindrical, 4- or 5-angled or 5- to 10-ribbed .....U

U. Style arms virtually glabrous or at most minutely papillose below the truncated or obtuse apex, with crown of divergent hairs but without appendage .....radiate species of *Senecio*

UU. Style arms thickly hairy on most or all of the outer face.....V

V. Capitula in racemes or racemose-paniculate inflorescences ..... *Ligularia*

VV. Capitula solitary, nodding (in one species discoid) ..... *Cremanthodium*

RR. Capitula discoid (marginal florets sometimes with anthers variably abortive) .....W

W. Style-arm apices with greatly prolonged, non-stigmatic, frequently recurved appendage X

X. Appendage vascularized, densely hairy on outer face; leaves somewhat crowded basally and subpetiolate or sessile; stem subscapose ..... *Gynura*

XX. Appendage not vascularized; basal leaves peltate .....*Psacalium*

WW. Style-arm apices with appendage not exceeding arm in length, or not appendaged .....Y

Y. Style-arm apex obtuse, unappendaged, lacking crown of divergent hairs ..... Z

Z. Style arm not hairy, but oblong and revolute ....*Cacalia* L. (*Adenostyles*)

ZZ. Style arm uniformly beset with hairs ....*Cacaliopsis, Luina, Peucephyllum*

YY. Style-arm apex penicillate with crown of divergent papillose hairs which is sometimes indistinct in immature florets .....a

a. Achene inverted-pyramidal or obovoid.....b

b. Achene inverted-pyramidal .....*Psathyrotes*

bb. Achene obovoid, elliptic in cross-section, 10- to 15-ribbed; corolla white or whitish with tube long and slender, throat obsolete, lobes long-linear and extending to throat; basal leaves long-petiolate .....*Odontotrichum*

aa. Achene prismatic or cylindrical c

c. Capitula axillary or in axillary panicles .....*Bedfordia*

cc. Capitula terminal or in terminal and axillary inflorescences .....d

d. Style arms thickly hairy on all of outer surface; capitulum solitary, nodding ..... *Cremanthodium* sp.
dd. Style arms glabrous or at most minutely papillose on outer surface ..... e
e. Style-arm apex truncated or low-domed, not appendaged, crown of divergent hairs usually well developed ..... f
f. Corolla white or whitish, throat elongate and narrowly funnelform, lobes conspicuously revolute after anthesis, pappus barbellate, slightly clavate..... *Pericalia*
ff. Corolla yellowish, infundibuliform, lobes usually erect, pappus not clavate ..... discoid species of *Senecio*
ee. Style arm acute with more or less prominent non-vascularized appendage of fused papillose hairs, crown of diverging papillae sometimes imperfectly formed or nearly wanting ..... g
g. Capitulum ecalyculate ..... h
h. Apex tufted with a multiseriate crown, the conical apex slightly prolonged in appendage of 3 to 6 short fused papillae; corolla deeply lobed; low canescent shrubs ..... *Tetradymia*
hh. Style apex with essentially uniseriate crown, conical apex prolonged in appendage up to half as long as the style arm proper; corolla not deeply lobed; herbs ..... *Emilia*
gg. Capitulum calyculate i
i. Style-arm appendage about as long as or longer than the style arm ..... *Crassocephalum*
ii. Style-arm appendage not more than half as long as the style arm ..... j
j. Appendage short, conical ..... *Kleinia*
jj. Appendage ovoid, capitula large ..... *Notonia*

SYSTEMATIC TREATMENT OF *ERECHTITES*

Erechtites Raf. Fl. Ludovic. 65. 1817. Type: *E. prealta* Raf.

Erechthites Raf. *emend.* Less. Syn. Gen. Comp. 395. 1832.
Erechtites Raf. *sensu extenso* DC. Prodr. 6: 295. 1838; Endl. Gen. Pl. 455. 1836-40; Dalla Torre & Harms, Gen. Siphon. 561. 1906.
Erechthites Raf. *sensu extenso* Benth. & Hook. Gen. Pl. 2:443. 1873; Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. IV^{5}: 291. 1894.
Neoceis Cass. Bull. Sci. Soc. Philomat. 1820:90. 1820; Dict. Sci. Nat. 34: 386, 1825 (*pro majore parte*).
Senecio spp. L. *et auct.*
Ptileris Raf. Am. Month. Mag. 268. 1818, *nom nud.*; *ex* Jacks. Ind. Kew. 4:657. 1895, *nom. nud.*

Annual or with perennial rootstock; roots fibrous; aerial shoots herbaceous or slightly woody at base, erect, sulcate, leafy, glabrous or variously pubescent. Leaves alternate, subpetiolate, decurrent, or semiamplexicaul, rarely petiolate, subentire, serrate, variously incised or lobed, or pinnatifid, acute, glabrous or variously pubescent. Capitula calyculate, heterogamous. Involucre uniseriate, more or less flask-shaped; phyllaries linear or lanceolate, equal, plurinervate with margins scarious, connivent in aestivation and anthesis, more or less divergent in fruit, finally divergent and strongly deflexed. Receptacle always without paleae, inconstantly plane, alveolate, or fimbrillate. Marginal florets filiform, 4- or 5-fid, pistillate or sometimes with rudimentary stamens in some, style-arm apices without marginal fringe

of pollen-presentation hairs but with apex conic-appendaged; central florets slenderly infundibuliform, 5-fid, perfect with functional ovary, style-arm apices divergent with a semi-circular crown of pollen-presentation hairs surmounted by a terminal appendage of fused papillose hairs more or less prominently developed, sometimes nearly wanting in section GOYAZENSES. Achene subcylindric to subfusiform, base inconspicuously callose-annulate, apex conspicuously callose-annulate, slightly constricted below the annulus but not attenuate-rostrate, about 10-ribbed, ribs prominent, cartilaginous, light brown, glabrous, intercostal planes dark brown, sparsely puberulous. Pappus pluriseriate, subequal, capillary.

Distinguished from *Crassocephalum*, *Gynura*, *Cacalia* (*sensu strictiore*), and discoid species of *Senecio* by the heterogamous rather than homogamous capitula, from radiate species of *Senecio* also by the corollas of the filiform marginal florets more or less regularly 4- or 5-fid rather than ligulate, and from erechthitoid (and all) species of *Senecio* by the style arm appendaged with fused papillose hairs rather than truncated or bluntly rounded; and from *Arrhenechthites* by the disc florets being numerous and developing viable embryos, rather than few or solitary and abortive.

Includes five species: one highly polymorphic and widespread in the less-elevated or more humid parts of both Americas and adventive in central Europe, Hawaii, Indonesia, and southeastern Asia; one widespread in continental tropical and subtropical America and adventive through many of the tropical Pacific Islands to northern Australia, Sumatra, the Malay States, and southeastern China; and three restricted to South America; not known from Africa. Formerly considered to include several species with filiform pistillate marginal florets, indigenous to Australasia, but these, without exception, lack the terminal appendage of fused papillose hairs on the style-arm apex and are accordingly here excluded from *Erechtites*, and treated as belonging in *Senecio* or (in one instance) in *Arrhenechthites*.

SECTIONS AND SPECIES OF *ERECHTITES*

Erechtites may be divided into two sections:

ERECHTITES *sectio* **Hieraciifoliae** Belcher, *sect. nov.*

Annuae, herbaceae; foliis caulinis non ultra octies longioribus quam latioribus; corolla lobata, non profunde fissa.

Type: *Erechtites hieracifolia* (L.) Raf. *ex* DC.

ERECHTITES *sectio* **Goyazenses** Belcher, *sect. nov.*

Perennes, suffruticosae; foliis caulinis decies longioribus quam latioribus vel angustioribus; appendicibus styli florum marginalium non obviis; corolla lobata, profunde fissa.

Type: *Erechtites goyazensis* (Gardn.) Cabr.

KEY TO SPECIES OF *ERECHTITES*

A. Annual, herbaceous; length of cauline leaves usually not over eight times their width; marginal florets with style-arm appendages well developed; corolla shallowly cleft ..... § HIERACIIFOLIAE
B. Leaf sessile, or if briefly petiolate then petiole conspicuously alate; diameter of capitulum about ½ its length; marginal florets bi- or pluriseriate; pappus white 1. *E. hieracifolia*
BB. Leaf petiolate or inconspicuously alate at base.
C. Diameter of capitulum less than ⅓ its length; marginal pistillate florets uniseriate or sub-biseriate; style-arm appendages long; corolla and pappus usually more or less reddish ..... 2. *E. valerianaefolia*
CC. Diameter of capitulum ½ its length or more; marginal pistillate florets bi- or pluriseriate; style-arm appendage short; corolla and pappus whitish ..... 3 *E. missionum*
AA. Perennial, suffruticose; length of cauline leaves at least ten times their width; marginal florets with style-arm appendages poorly developed, sometimes wanting; corolla deeply cleft ..... § GOYAZENSES
D. Capitulum slender, scarcely exceeding 1 cm. long and 0.4 cm, wide; corolla lobes linear-lanceolate ..... 4 *E. goyazensis*
DD. Capitulum thick, 2 cm. long, 1 cm. wide, or larger; corolla lobes deltoid ..... 5. *E. ignobilis*

§ HIERACIIFOLIAE

1. ERECHTITES HIERACIFOLIA (L.) Raf. *ex* DC. Prodr. 6: 294. 1838.

Annual herb, 4 cm. to 2 m. tall, simple or much branched above; stem glabrous, setose, or pilose. Leaves alate and attenuate at base or semiamplexicaul, acute, with 8 to 25 indistinct pinnate veins on either side, each diverging from the midrib at about 45°, running irregularly forward and terminating in an acute callose tooth; oblanceolate, oblong-lanceolate, lanceolate, or linear-lanceolate; margins subentire, irregularly serrate, incised-serrate, sinuate-dentate, irregularly and coarsely lobate-dentate, or subpinnatifid; glabrous or minutely pubescent on nerves beneath or sparsely to densely clothed with fine unicellular or coarse multicellular hairs up to 5 mm. long in pilose states of var. *cacalioides;* membranous to subcoriaceous; lower ones from 1 to 10 to 30 cm. long, 0.5 to 2 to 7 cm. wide, gradually or abruptly reduced upwards. Inflorescence varying from a single terminal capitulum in depauperate specimens to decompound terminal and axillary corymbose panicles of 50 or more capitula; branches glabrous to pilose, bracts ranging from broadly amplexicaul to attenuate. Capitula with bracteoles of the calyculus linear, variable in number and length, and glabrous or ciliolate with unicellular or multicellular hairs and either with or without multicellular hairs on their outer faces. Phyllaries 8 to 11 (to 13 to 15) mm. long, 0.5 to 1.0 (to 2.0) mm. wide, broadly linear or oblong, entirely glabrous to sparsely setulose; apices bluntly acute to subobtuse, often darkened but not sphacelate, usually minutely papillose-ciliolate. Florets numerous, varying from 20 to 25 (to 150 or more); corolla of marginal florets in var. *hieracifolia* and var. *cacalioides* 7.5 to 11 mm. long with throat 0.5 to 1 mm. long and only slightly dilated to diameter of 0.5 to 0.75 mm., 4- or sometimes 5-fid, lobes 0.4 to 0.5 mm. long, in var. *megalocarpa* similar, 10 to 12 mm. long; corolla of disc florets in above varieties 8 to 12 mm. long, throat 1.5 to 2 mm. long, slenderly campanulate, with circumference of 1.5 to 2.0 mm., 5-fid, 10-nerved, lobes 0.5 to 0.7 mm. long; corolla lobes in disc florets of var. *megalocarpa*

11 to 13 mm. long, very slenderly campanulate, throat 1 mm. long, 5-fid, lobes 0.75 mm. long, 0.4 to 0.5 mm. wide. Achenes strongly costate.

Species highly polymorphic, but divisible into three varieties. Widely distributed from southern Canada to northern Argentina, but absent from the prairie, high montane, and Pacific coastal regions. Unknown from Africa, the Near East and Australasia. Its reputation as a pantropical weed rests largely on confusion with *Crassocephalum crepidioides* (Benth.) S. Moore.

Several departures of the foliage from the narrowly defined type have been given varietal or even specific rank. In fact, *Erechtites* itself was founded on one such variant. After examining a large suite of specimens, both dried and living, I have concluded that foliar characters do not offer a reliable basis for separation of varieties (nor for the establishment of *formae*) within this species. I have seen every degree of variation in the leaf from the subpetiolate oblanceolate to the broadly amplexicaul lanceolate state without finding at any point an obvious and usable discontinuity. Furthermore, I have been able to duplicate much of the spectrum of variation in greenhouse culture by manipulation of the environment. The same series of foliar variation is clearly discernible in plants both of tropical and of temperate habitat.

I have based the two main varieties maintained here on features which do appear to be discontinuous and to show a geographical pattern. The most accessible of these features are the length of the calycular bracteoles and the type of pubescence. That it has been necessary to use so slender a distinction will perhaps in itself be sufficient answer to those who, without extensive examination of the full range of variation, would establish separate species for the extremes of the temperate and the tropical zones.

KEY TO VARIETIES OF *ERECHTITES HIERACIFOLIA*

A. Bracteoles of the calyculus extending less than ¼ the length of the involucre; bracteoles of the peduncle much shorter than the involucre; all bracteoles glabrous or beset with unicellular hairs only.
  B. Capitula with denuded receptacles less than 1 cm. in diameter; achene 2.5 to 3 m. long, 10-costate.....1 a. var. *hieracifolia*
  BB. Capitula with denuded receptacles more than 1 cm. in diameter; achene 4 to 4.5mm. long, 16- to 20- costate .....1 b. var. *megalocarpa*
AA. Bracteoles of the calyculus extending more than ¼ the length of the involucre; bracteoles of the peduncle approximately as long as the involucre; all bracteoles ciliolate with multicellular hairs.....1 c. var. *cacalioides*

1a. ERECHTITES HIERACIFOLIA var. HIERACIFOLIA

Senecio hieracifolius L. Sp. Pl., ed. 1. 866. 1753; ed. 2. 1215. 1762; ed. 3, 1215. 1764; *non* L. Mant. 469. 1771, which is var. *cacalioides*; *non* Forssk. Fl. Aegypt. 73. 1775; *non* Walt. Fl. Carol. 208. 1788, a radiate species; *non* Herb. Labill., which is *Senecio minimus* Desf. *ex* Poir.!

Sonchus laevis Sloane, Cat. Pl. Jam. 122. 1697; Nat. Hist. Jam. 255. 1707 (vol. 5, p. 1 Sloane Herb. BM!, first record of temperate var. *hieracifolia* in the Caribbean, surely not in Madeira).

Anonyme Robin, Voy. Louisiane 3:435. 1807, basis of *E. prealta* Raf.

Erechtites prealta Raf. Fl. Ludovic. 65. 1817.

Senecio seminudus Bory, Ann. Gèn. Soc. Phys. 1: 303-307. *pl. 12.* 1819; figure clearly depicting non-amplexicaul reduced upper leaves described by Fernald for var. *intermedia.*

Neoceis hieracifolia (L.) Cass. Bull. Sci. Soc. Philom. 1820: 91. 1820; Dict. Sci. Nat. 34: 387. 1825; type of *Neoceis* Cass.

Neoceis rigidula Cass. l. c.; by descr. also equivalent to var. *intermedia* Fern.

Senecio hieracifolius L. var. *gigantea* Raf. Med. Fl. 2:262. 1830; by descr. a very robust specimen, to 8 ft. tall, of the typical variety.

Senecio Vukotinovici Schloss. Oesterr. Bot. Zeit. 31: 5. 1881; Schloss. *ex* Vukot. Rad. Jugoslav. Akad. 58: 85, 145. 1881.

Senecio sonchoides Vukot. Fl. Exsicc. Austro-Hungr. n. 658. 1881 [?], based on Schlosser's species, superfluous; *non* Kunth in HBK. Nov. Gen. & Sp. 4: 178. 1820.

Erechthites hieracifolia (L.) DC. var. *glabrescens* O. Ktze. Rev. Gen. Pl. 1:335. 1891, *nom. nud.*

Erechthites hieracifolia Raf. forma *minor* Waisb. Oesterr. Bot. Zeit. 45:109. 1895; said to be united to the typical state by "Uebergangsformen"; *Waisbecker* (US!) agrees exactly with authentic material of var. *praealta* Fern.

Ptileris hieracifolia Raf. *ex* Jacks. Ind. Kew. 2:657. 1895; *nom. nud.*

Erechtites hieracifolia (L). Raf. in DC. var. *typica*, var. *intermedia* Fern., and var. *praealta* (Raf.) Fern. Rhodora 19:27. 1917; Gray's Man., ed. 8. 1528. 1950.

Cytology: Cooper, Bot. Gaz. 98:348-355, 1936.

Seedling Morphology: Kumner, Weed Seedlings, 381-382, 1951.

Common names: Fireweed; Butterweed (Kentucky Mountains).

Lectotype: *"Senecio hieracifolius,"* 996-1 (LINN!)[20]

Habit, stem, and foliage as in the species. Bracts subtending the peduncles and peduncular bracteoles usually not as long as the capitulum, often not half as long; calycular bracteoles linear, very short, glabrous or sometimes minutely ciliolate with unicellular hairs, never having coarse multicellular hairs; phyllaries (7 to) 11 to 16 (to 21), linear, glabrous or minutely glandulose-papillose. Denuded receptacles (3 to) 5 to 8 (to 9) mm. in diameter. Achenes 2.5 to 3 mm. long, 0.5 mm. in diameter, 10-costate.

Prince Edward Island to southeastern Saskatchewan to Minnesota, south to southeastern Texas, to Florida; of scattered occurrence in the West Indies from Cuba to Puerto Rico and possibly through the Lesser Antilles to Venezuela and the Guianas; an introduced weed in the Hawaiian Islands and Central Europe; primarily an occupant of recently disturbed areas in forest zones.

CANADA. PRINCE EDWARD ISLAND: Bunbury, Aug. 1912, *Fernald, Long & St. John 8242* (K). QUEBEC: St. Lawrence Estuary, Portneuf, Aug. 1928, *Marie-Victorin 28309* (K, S); Île Perrott, Oct. 1928, *Marie Victorin 28657* (K, S,); Gatineau Park Skyline Trail, July 1941, *Senn 2078* (S). ONTARIO: Battersea, Aug. 1898, *Fowler* (F); Galt, bogs, Aug. 1899, *Umbach* (F); Algonquin Park, Aug. 1900, *Macoun 21827* (F) SASKATCHEWAN: Alameda, *Drummond* (K).

UNITED STATES. MAINE: Mt. Megunticook, Camden, Aug. 1930, *Steyermark 2181* (F); Megunticook Lake near Tsuga Lodge, Sept. 1946, *Friesner 20982* (S). MASSACHUSETTS: Cambridge, waste ground, Aug. 22, 1928, *Smith & Steward* in *Pl. Exsicc. Gray 899* (as var. *intermedia* Fern., F, K, MICH, S); Cape Cod near Nine Mile Pond, Sept. 1898, *Greenman 399* (K); Wakefield, Tyler's Woods, Sept. 1915, *Ripley 15816* (S); S. Dartmouth,

[20] Herbaria in which cited specimens are located are indicated by abbreviations recommended by Lanjouw (International Code of Botanical Nomenclature adopted by the Seventh International Botanical Congress, Stockholm, 1950).

Salter's Point, Sept. 1917, *King 146* (F); Dracut, sandy field, Aug. 1930, *Beattie* (K, det. as var. *praealta* Fern., very depauperate). CONNECTICUT: New Haven, 1858, *Eaton*, (S); Groton, dry woods, Sept. 1927, *Janssen* (S). NEW YORK: mint woods near North Chemung, July 1896, *Lucy 5216* (S); Binghampton, Ely Hill, recent clearing, Aug. 1886, *Millspaugh* (F); Long Island, Cold Spring Harbor, Aug. 1903, *Whitford 75* (F). NEW JERSEY: Milltown, July 1891, *Halstead's Amer. Weeds No. 40* (MICH); Pleasantville, in marsh, Oct. 1916, *Tidestrom 7999* (F). PENNSYLVANIA: Bethlehem, Aug. 1832, *Moser* (K, FI); Philadelphia, Sept. 1849, *Prior* (K); West Chester, *Darlington* (K, FI); Dauphin, Sept. 1887, *Small* (F); Lancaster Co., near Smithville, Sept. 1892, *Heller & Halbach* (F); Strattonville, Oct. 1928, *Eggleston 22838* (US). OHIO: Elyria, shale banks of Black R., Oct. 1891, *Strong* (MICH); Albion, July 1897, *Ashcroft* (F); Sandusky, Sept. 1908, *Mosely* (F); Lawrence Co., clay pit south of Blackfork, Sept. 1952, *Belcher 1115, 1116, 1117;* same location, Oct. 1952, *Belcher 1122* to *1140* inclusive (series to show range of variation, with achenes for planting). INDIANA: Dune Park, Aug. 1890, *Hill 116* (F); Wells Co., near Bluffton, Aug. 1898, *Deam* (F); Miller, base of dune, Sept. 1900, *Lansing 1198* (F, 2); west of Metamora, Sept. 1935, *Friesner 9187* (F). ILLINOIS: Lake View (Chicago), Sept. 1884, *Ohlendorf* (F). MICHIGAN: New Richmond, Aug. 1910, *Kauffman* (MICH); Benton Harbor, near St. Joseph Riv., Sept. 1910, *Lansing 2877* (F); Clinton, Sept. 1838, *Houghton* (MICH); Prairie Rhonde, edge of rich maple woods, Sept. 1903, *Burgess 287* (F); Mackinac Co., Prentis Bay, Sept. 1916, *Ehlers 272* (MICH); Menominee Co., between Cedar River and Stephenson, Aug. 1933, *Grassl 3005* (MICH); Drayton Plains, Aug. 1922, *Farwell 6354* (MICH); St. Clair Co., near Port Huron, Aug. 1892, *Dodge*, (MICH); Flowerfield, *Burgess 424* (F); Ann Arbor, Aug. 1862, *Almendinger* (MICH). WISCONSIN: Raukana, Aug. 1879, *Schuette* (F, upper leaves broadly amplexicaul, most westerly station noted for this variant); Dane Co., N. of Cross Plains, Sept. 1916, *Heddle 2667* (F); Trempealeau, Aug. 1927, *Fassett 4496* (MICH). MINNESOTA: Center City, Aug. 1892, *Taylor* (S). IOWA: Decatur Co., Aug. 1898, *Fitzpatrick* (F). MISSOURI: St. Louis, 1832, *Drummond* (K, 2); Davis Spring, Aug. 1937, *Moore* (F); Shelby Co., N. W. of Emdem, Sept. 1948, *Steyermark 66595* (F); N. W. of Chillicothe, Aug. 1951, *Sparling 1325B.* (F). DELAWARE: dune region between Cape Henlopen and Rehoboth Beach, *Snow 72, 192* (F). MARYLAND: Relay, Aug. 1910, *Jones* (F). DIST. OF COLUMBIA: near Georgetown, Oct. 1858, *Schott* (F); Washington, Sept. 1897, *Pieters* (MICH, complete plant 8.5 cm. tall, one capitulum). WEST VIRGINIA: Smyth Co., Pine Glade Mtn., Aug. 1892, *Small* (F). NORTH CAROLINA: Statesville, *Hyams* (MICH); Hot Springs, Aug. 1924, *Wehmeyer 694* (MICH, 2). KENTUCKY: Bell Co., near Wasioto, Sept. 1893, *Kearney 502* (F); Meade Co., Otter Creek, Sept. 1950, *Een* (S); about 2 mi. west of Ashland, on weathered shale in highway cut, Sept. 1952, *Belcher 1118, 1118A;* roadside park 7 mi. E. of Vanceburg, by edge of woods, Sept. 1952, *Belcher 1119* (shade form leaves petiolate). ARKANSAS: Bradley Co., Jersey, "bottom thickets, 8 ft. high", Sept. 1938, *Demaree 18313* (F); Warren, banks of Saline River, Sept. 1938, *Demaree 18388* (F). TEXAS: Harrisburg, Sept. 1875, *Joor* (MICH); Hocklev, 1890, *Thurow* (F). FLORIDA: Miami, *Hitchcock* (F); S. of Florida City, March 1930, *Moldenke 744* (K, S); Duval Co., waste places., *Curtiss 1556* (K, S); vicinity of Eustis, March 1894, *Nash 111* (K, MICH); Ft. Myers, 1900, *Hitchcock 142* (F); Clarcona, Nov. 1899, *Meislahn 126* (US); Palm Beach, 1896, *Hitchcock 925* (F).

WEST INDIES. CUBA: Havana, Guanabacoa, May 1914, *Ekman 618* (S); Oriente, Bayate. Nov. 1914, *Ekman 3403* (S); Sierra Maestra, above Daiquiri, Oct. 1916, *Ekman 8063* (S). JAMAICA: St. Louis, roadsides, 1850, *Prior* (K); Glasgow, near Troy, Oct. 1917, *Harris 12637* (F). HAITI: Dept. du Nord, cultivated field north of St. Michel, Dec. 1925, *Leonard 7741* (F); Massif du Nord, May 1927, *Ekman H8305* (S). DOMINICAN REPUBLIC: Santo Domingo City, at Rio Ozama, Jan. 1929, *Ekman H-11375* (S). PUERTO RICO: waste ground, Martin Pena, March 1924, *Dale* (MICH); Cayey, in Monte Llano, Sept. 1885, *Sintenis 2412* (F, left and center specimens only, right is *Sonchus* sp.).

EUROPE. CZECHOSLOVAKIA: Moravia, prope urbem Přerov, Aug. 1928, *Ortuba, Fl. Exsic. Reipub. Bohem. Slov. 951* (S, US); Olmüvzl, Přerov, Sept. 1938, *Laus* (K). AUSTRIA: prope Purkersdorf, Sept. 1909, *Keller 5102* (S); Söchau, Waldblössen, Aug.

1909, *Sabransky* (S), Waldrodungen, *Sabransky* (US); Wurmberg prope Pettau, Sept. 1915, *Maly* (K, 2). HUNGARY: Comit. Arad. in silvis caeduis montis Piliske, Aug. 1916, *Kümmerle & Jávorka, Fl. Hung. Exsic. 588* (F, K, S, US); Reposmere, Sept. 1922, *Jávorka* (K); Waldschläge bei Güns, Aug. 1897, *Waisbecker* (US, as "*E. hieracif.* Raf. v. *minor* Waisb."); Croatia, in silvis caedius Maximir, July 1883, *Vukotinovič* (K), in silvis caediis ad Zagrabam, *Wormastiny, Fl. Exsic. Austro-Hung. 658* (K). RUMANIA: Transylvania, ad Görzcuysrentinirc, Sept. 1913, *Heuzyel* (S).

HAWAIIAN ISLANDS. KAUAI: near Hanalei, Sept. 1922, *Degener 1521* (NY). OAHU: Honolulu, "introduced weed", June 1916, *Hitchcock 13716* (US); Honolulu, Tantalus Mountain, June 1923, *Degener 1520* (NY). MOLOKAI: Tukoo, Oct. 1916, *Hitchcock 15034* (US). WEST MOLOKAI: Hauakea, Pali, arid plain, April 1928, *Degener 18134* (NY). HAWAII: Flow of 1840, Puwa [?], July 1915, *Forbes 1055-H* (NY).

Fernald concluded that "*Erechtites hieracifolia* is a very polymorphous plant and that much tropical American material referred to it belongs clearly to some other species. In the eastern United States and Canada the plant, although apparently all of one species, is very variable." He defined *Senecio hieracifolius* L. as having auriculate-based clasping leaves, on the basis of Hermann's figure and the diagnosis in the 'Species Plantarum'; and *Erechtites praealta* Raf. as having *all* leaves basally narrowed, on the basis of Rafinesque's description. He then stated that these two plants are "in their involucres and achenes clearly extremes of one species, but so different in foliage that they should be designated as forms or varieties". Fernald next stated that the most common variation appeared to be neither of the above, but one "with the upper leaves sessile and broad at the base but very rapidly decreasing to small bracts below the inflorescence", which he described as a new variety, *intermedia*. From an examination of herbarium material he concluded that "the three plants seem to have somewhat different ranges and they are therefore here treated as geographic varieties"; namely, var. *typica*, var. *intermedia* Fern., and var. *praealta* (Raf.) Fern. This treatment he maintained without modification in the 8th edition of 'Gray's Manual.'

Fernald's paper afforded an excellent starting point for my investigations, but I have to disagree with his conclusions. The tropical material is not specifically distinct from that of the temperate zone. His new variety *intermedia* has previously been described as a species. The three states he named do not in fact have clearly distinct geographical ranges, but may exist side by side in the field and may occur in the progeny of a single plant during greenhouse culture. Finally, he formed a very inadequate concept of *E. prealta*.

The earliest name applied to the "intermediate" state is *Erechtites prealta* Raf.! As there is no specimen surviving, it must be typified by Robin's description. This is of a discoid Composite some 6 or 7 feet tall; with sessile leaves 1 foot long and 4 inches wide, oblong, attenuated toward the base, irregularly toothed, acute, glabrous with the nerves underneath covered with down; the involucre "monophyllous" 7 to 8 lines long, 3 to 4 lines in diameter, fleshy, "glanduleuse", striate, terminated by a score of little teeth; florets white, 5-toothed; growing in the open near woods and flowering in September.

This description undoubtedly applies to an *Erechtites*, despite omission of several details. It also obviously refers to a very robust specimen. The description of the

leaf is hardly definitive. The measurements of size certainly do not apply to all of the leaves indiscriminately, but surely only to the lower ones. It then is reasonable to assume that the phrases which immediately follow these measurements; namely, "oblongues, plus rétrécies à la partie inférieure", also apply to these same large lower leaves and therefore *not necessarily* to those higher up which are of course smaller. It is a general feature of every complete dried plant of *Erechtites* which I have seen, and of all those which I have grown from seed or seen in the field, that the lowest leaves are basally narrowed, even to the extent of being briefly petiolate.

This intimate association of the description of the size and of the base of the leaves was, however, severed by Rafinesque, who also modified the description in other unfortunate ways. Thus Fernald, apparently without referring to Robin's original description, construed Rafinesque's "foliis . . . basi attenuatis" as applying to *all* the leaves and particularly to the upper ones. He therefore placed the taxon *praealta* in varietal status, containing the plants which do have all the leaves attenuated; that is, those depauperate specimens called f. *minor* by Waisbecker. Although Fernald cited no specimens for his var. *praealta*, all of the sheets distributed from the Gray Herbarium under this name which I have seen are of this depauperate state, scarcely one foot tall, so much at variance with Robin's description and so contradictory of the epithet.

In several hundred sheets of *E. hieracifolia* var. *hieracifolia* from a dozen major herbaria, I have seen virtually every conceivable degree of intergradation among the extremes recognized by Fernald. And, like Deam,[21] I have seen and collected not two but all three of these extremes plus other intermediate states in the same location, growing virtually side by side, with the variation in leaf form correlated with over-all size and that apparently directly related to soil fertility and moisture supply.

This field experience has been substantiated by four years of growing these plants in the greenhouse under varying conditions of moisture, fertility, and photoperiod. These studies, still incomplete, seem to indicate that the lower nodes always produce leaves with attenuate, even subpetiolate, bases; that expansion of the basal region of the leaf begins rather abruptly about the 30th to 35th node, and reaches the broadly amplexicaul condition only if the sudden bolting which marks the transition from the vegetative to the reproductive phase is delayed beyond the maturation of this region. If vegetative growth is retarded by limiting either water or nutrients, or terminated by the onset of short days, floral initiation appears before leaf-base expansion can occur. By varying the degree of stress applied, sister plants grown from achenes taken from a single capitulum of a plant with broadly amplexicaul bracts have been made to yield a spectrum of variants ranging from minute specimens only 6 cm. high and bearing four or five subpetiolate leaves and a single tiny capitulum to specimens over 2 m. tall and bearing hundreds of

[21] Fl. Indiana, p. 994. 1940.

large capitula, the lower ones on extensively ramified branches subtended by large broadly amplexicaul bracts.

The "intermedia" condition arises readily in summer plants restricted in access to soil nutrients by being retained in 3-inch pots without additional fertilizer but well supplied with water. Such plants commonly show signs of nitrogen starvation in the lowest leaves, and fail in various degrees to develop complete tops. Their growth is usually good at first but later it slows down so that the critical day length is reached, and bolting, sharply marked by a maximal internodal length, occurs just after leaf-base expansion has begun. Once bolting starts, the expansion of leaves at the superior nodes is severely and progressively retarded, resulting in the familiar series of bracts and bracteoles. Furthermore, in plants undernourished at and after bolting, the development of floriferous axillary branches is greatly inhibited and may not descend below the 40th node, whereas in well-nourished plants such branching may extend to or even below the 20th node. This results in the condition described by Fernald, of the "upper leaves sessile and broad at the base but very rapidly decreasing to small bracts below the inflorescence". A more accurate statement would be that the lower part of the inflorescence fails to develop properly, for minute capitula can usually be discerned in the axils of these supposedly reduced leaves, which are indeed bracts.

The common name of var. *hieracifolia* is well explained by Pursh[22]: "This is one of the plants which spring up in the most remote western counties when the land is cleared of timber, particularly when the brushwood is burnt on the ground; from which circumstance it is generally known by the name of fireweed." The logic of the name "butterweed", by which this plant was well known to me as a boy in the hills of Kentucky, has eluded me.

1b. ERECHTITES HIERACIFOLIA var. MEGALOCARPA (Fern.) Cronq. Rhodora 48: 122. 1946.

Erechtites megalocarpa Fern. Rhodora 19:24. 1917.

Leaves large, 10 to 15 cm. long, 3 to 7 cm. wide, fleshy; capitula 1 cm. or more in diameter (pressed) and to 2 cm. long including pappus; phyllaries 16 to 21 or more, lanceolate, 13 to 15 mm. long; florets 100 or more, corolla lobes with brown margins and nerves; achenes (3.5 to) 4 to 5 mm. long, up to 1 mm. in diameter (i. e., twice the diameter of the achene of var. *hieracifolia*), subturbinate, 16- to 20-costate.

TYPE: Upper and middle regions of sandy sea-beach, West Yarmouth, Mass., Oct. 8, 1916, *Fernald, Butters & St. John 15468* (G).

Coast of southern New England, where it occurs along the beaches and in salt marshes.

CONNECTICUT: Groton, seashore, Sept. 1927, *Janssen* (S); Oct. 1927, *Janssen* (S).

MASSACHUSETTS: Yarmouth, sandy beach of Nantucket Sound, Oct. 14, 1916, *Fernald & Butters, Pl. Exsic. Gray 299* (F, K, MICH, S, W; paratypes); salt marsh northeast of Bass River Light, Dennis, Sept. 1918, *Fernald & Long 17636* (F, K, MICH, 2); Bourne, inner edge of Monument Beach, Sept. 1929, *Blake 10975* (F, K, S); Wareham, *Blake 10962* (K).

[22] Fl. Amer. Sept. 2:529. 1814.

In reducing Fernald's species to varietal rank, Cronquist stated that he was unable to see any real specific discontinuity, with which I agree, and that he regarded it as a "saline marsh ecotype". Fernald apparently was not convinced, since he continued to treat it as a species. It may well be that this large-headed state is a polyploid, perhaps a simple tetraploid, of var. *hieracifolia*.

Most of the specimens of var. *megalocarpa* which I have seen strongly resemble the broad-bracted state of var. *hieracifolia* but have the bracts or uppermost leaves just below the inflorescence very broad at the base, up to as much as 5 cm. wide. It is therefore of particular interest that one of the specimens examined from Connecticut, *Janssen*, Oct. 3, 1927, shows a distinct departure from this pattern, even as represented by *Janssen*, Sept. 3, 1927. In the former, the leaves immediately below the inflorescence, instead of being very broadly semiamplexicaul and large, are much reduced in all dimensions, with the semiamplexicaul base only 1 cm. wide, and the medial leaves are basally attenuated instead of being broadly clasping. Although the specimen lacks the basal portion, it seems probable from the reduction in the degree of branching and in the size of the branches that this October gathering was from a plant less robust than the others. This would accord well with the thesis that foliar form is largely under environmental control, not only in var. *hieracifolia* but in var. *megalocarpa* as well. It also reinforces the interpretation of this taxon as being of varietal rather than of specific rank.

1c. ERECHTITES HIERACIFOLIA var. CACALIOIDES (Fisch. *ex* Spreng.) Griseb. *emend.* Belcher.

Erechthites hieracifolia (L.) DC. var. *cacalioides* (Fisch. *ex* Spreng.) Griseb. Fl. Brit. W. Ind. 381. 1861 (species incorrectly attributed to Raf. and var. to Less.), and var. *carduifolia* (Cass.) Griseb. *l. c.* (incorrectly attributed to DC.).

Senecio hieracifolius L. Mant. Pl. 469. 1771, Type: *P. Browne* (LINN 996-2), *non* Sp. Pl. 886. 1753; Willd. Sp. Pl. ed. 4. 3:1974. 1800, *pro parte.*

Senecio cacalioides Fisch. *ex* Spreng. Nov. Prov. 37. 1819; Syst. Veg. 3:565. 1826; Link, Enum. Pl. Hort. Berol. 2:325. 1822.

Sonchus agrestis Sw. Prodr. 110. 1788, *excl. syn.*; Fl. Ind. Occ. 3:1289. 1806, *excl. syn.*; Willd. Sp. Pl. ed. 4. 3:1513. 1800; Spreng. Syst. Veg. 3:648. 1826.

Neoceis carduifolia Cass. Bull. Sci. Soc. Philom. Paris 1820:91. 1820; Dict. Sci. Nat. 34:386. 1825.

Sonchus occidentalis Spreng. Neue Entdeck. 2:143. 1821; Syst. Veg. 3:648. 1826. Type: Sprgl. Herb. n. 1985 (P!).

Senecio carduifolius (Cass.) Desf. Cat. Hort. Paris. ed. 3. 177. 1829 (not 1819, as cited by de Candolle).

Erechthites cacalioides (Fisch. *ex* Spreng.) Less. Syn. Gen. Comp. 395. 1832; DC. Prodr. 6:295. 1838 (as *Erechtites*), as to descr., not specimen.

Erechtites carduifolia (Cass.) DC. Prodr. 6:294. 1838; Benth. Vidensk. Meddel. Naturhist. Forening Kjoben. 106. 1852; Walp. Ann. Bot. Syst. 5:290. 1858.

Erechtites hieracifolia Walp. Rep. Bot. Syst. 2:651. 1843; Cabr. Rev. Mus. La Plata 4:286, *f.* 90. 1941; *non* DC.

Sonchus brasiliensis Meyen & Walp. Nov. Act. Acad. Caes. Leop. Carol. Nat. Cur. 19, Suppl. 1:293. 1843.

Senecio Fischeri Sch. Bip. Flora 28:498. 1845.

Erechtites sulcata Gardn. Lond. Jour. Bot. 7:419. 1848. Type: Goias, *Gardner 3868* (K!).

Erechthites hieracifolia (L.) DC. var. *cacalioides* Less. f. *pubescens* O. Ktze. Rev. Gen. Pl. 1:335. 1891, *nom. nud.* Of 4 collections cited, one at least, "Java, Sindanglaja, *Kuntze 4488* (NY!), is typical var. *cacalioides*.

Erechthites carduifolia DC. var. *latifolia* Klatt, Bull. Soc. Roy. Bot. Belg. 36:291. 1896, *nom. nud.* Type: Costa Rica, San Rafaël, *Pitt. 6968*, not seen.
Gynura zeylanica Trim. var. *malasica* Ridl. Jour. Str. Br. Roy. Asiat. Soc. 61:24. 1912.
Gynura malasica (Ridl.) Ridl. Fl. Malay Penins. 2:190. 1923, *excl.* Griffith's specimens from Malacca, which are true *Gynura*.
Gynura aspera Ridl. Jour. Malay Br. Roy. Asiat. Soc. 1:74. 1923. Type: Sumatra, Berastagi, Feb. 8 ("dwarf form"), Feb. 10, 1921, *Ridley* (K!).
Erechtites agrestis (Sw.) Standl. & Steyerm. Field Mus. Publ. Bot. 23:265. 1947; Rydberg, *in herb.*

Bracteoles of the calyculus long, extending to one-third to one-half the length of the involucre, typically ciliolate with coarse multicellular hairs; phyllaries 12 to 14 (to 21), glabrous or sparsely and irregularly beset with multicellular hairs.

Holotype (?): "Senecio cacalioides, Fischer, 1818, Sprgl.!, *herb. n. 1687*, Syst. III, 565, n. 176." (P!).

Very variable in habit and leaf form, showing much the same series of variations as in var. *hieracifolia*, with the variations intergrading in every degree. A characteristic state in Florida is intermediate between var. *cacalioides* and var. *hieracifolia* in that the bracteoles are long but lack multicellular hairs. Especially variable in Brazil, one particularly interesting state from Paraná having a distinct basal rosette of leaves.

MEXICO. TAMAULIPAS: Tampico de Tamaulipas, Feb. 1827, *Berlandier* (FI, 2); vicinity of Tampico, Jan. 1910, *Palmer 107* (F, K). VERA CRUZ: "Savannes de Mirador", 1838, *Linden 1180* (K, P); damp places near Jalapa, 1840, *Galeotti 2240* (K); near Jalapa, May 1899, *Pringle 8187* (BM, F, K, S); Sanborn, April 1910, *Orcutt 3018* (F); vicinity of Vera Cruz, *Wawra* (W). JALISCO: "Jalisco, 1886", *Palmer 248* (BM); Quimixto, Nov. 1926, *Ynes Mexia 1193* (BM, F, MICH). CHIAPAS: Mt. Ovando, Escuintla, Nov. 1945, *Matuda 16169* (F); Mandolopez, June 1947, *Matuda 16647* (F). TABASCO: Boca Cerro, Tenosique, July 1939, *Matuda 3581* (MICH). CAMPECHE: Palizada, July 1939, *Matuda 3858* (F, K, MICH). YUCATAN: Buena Vista, Xbac, *Gaumer 1438* (F, S); Pocobach, *Gaumer 2394* (BM, F).

GUATEMALA. EL PETEN: La Libertad & vicinity, 1933, *Aguilar 207* (MICH); Lake Zotz, May 1933, *Lundell 3294* (MICH). ALTA VERAPAZ: Cobán, Jan. 1908, *von Türckheim II 1319* (BM, F, MICH, S); Finca Socuyó, N. E. of Carchá, April 1939, *Standley 70260* (F). GUATEMALA: near Amatitlán, Dec. 1938, *Standley 61433* (F). IZABAL: Livingston, sandy beach, Feb. 1905, *Deam 244* (MICH). SACATEPÉQUEZ: along Rio Guacalate, N. of Antigua, Feb. 1939, *Standley 64698* (F). SUCHITEPÉQUEZ: Mazatenango, March 1928, *Morales 1039* (F). ESCUINTLA: S. of Rio Burrios, March 1941, *Standley 89624* (F). SANTA ROSA: Volcan Jumaytepeque, 8000 ft., Jan. 1893, *Heyde & Lux 4227* (F), 6000 ft., Dec. 1892, *ibid 4247* (K, 2). JALAPA: between Jalapa and La Laguna, Nov. 1940, *Standley 76933* (F). ZACAPA: Sierra de las Minas, Oct. 1939, *Steyermark 29638, 29719* (F). JUTIAPA: Lago Retana, between Ovejero and Progreso, Nov. 1939, *Steyermark 32027* (F).

BRITISH HONDURAS: Belize River, Sunnyland bank, March 1933, *Lundell 4028* (K, MICH); Prospecto, northern river, *Gentle 918* (K, MICH, S). HONDURAS: Morazán: Zamorano, Feb. 1945, *Rodriguez 2302* (F); Santa Clara Creek, Rio Yeguare valley, Aug. 1946, *Williams & Molina 10338* (F); lower slopes of Cerro de Uyuca, *Standley & Molina 4181* (F); moist valley near Las Mesas, Feb. 1947, *Williams & Molina 12053* (F); hills above Jicarito, Nov. 1950, *Williams 17293* (F). El Cayo: Mountain Pine ridge, March 1931, *Bartlett 11917* (MICH). Atlántida: Lancetilla Valley, near Tela, *Standley 53644* (F). Santa Barbara: Los Dragos, on Rio Chamelecón, April 1947, *Standley & Linderlie 7426* (F). NICARAGUA. Grenada: Volcan Mombacho, Feb. 1904, *Baker 2346* (K). Managua: Sierra de Managua, *Gaumer* (F). Chontales, 1867-8, *Tate 183 (221)* (BM, 2; K). Without data: *Lévy 274* (K); 1867, *Seemann 96* (BM). COSTA RICA: Cartago, Dec.

1887, *Cooper 5802* (K, F); Ferme de Guacimo, July 1901, *Tonduz 14744* (BM); Galieros, cultivas, Aug. 1919, *Lankester K-154* (K); La Palma de San Ramón, Nov. 1927, *Brener 5806* (F); Tablazo, Jan. 1935, *Valerio 1090* (F); Prov. San José, vicinity El Géneral, July 1936, *Skutch 2706* (K, MICH, S); Guadaloupe de Zarcero, 4500 ft., Oct. 20, 1937, "herb . . . with erect branches to 16 [sic!] feet . . . in rich loam in sun in land recently cleared of forest", *Austin Smith A-557* (F). PANAMA: Empire station, Nov. 1861, *Hayes 587* (BM, K); "in ruderalis prope urb. Panama", *Seemann 444* (BM, K, P); Canal Zone, Barro Colorado Island, July 1931, *Starry 283* (F).

WEST INDIES. BAHAMAS: Red Bays, Andros, April 1890, *Northrup* (F). CUBA: Herradura, March 1906, *Hitchcock* (F); Camaguey, Tiffin, March 1909, *Schafer 1090* (F); Havana, Puentes Grandes, April 1914, *Ekman 483* (S); Oriente, Bayate ad Rio Jagua, May 1919, *Ekman 9610* (F, S), Sierra Maestra supra Daiquiré, Oct. 1916, *Ekman 8177* (F, S). ISLE OF PINES: Pedernales Point, Feb. 1889, *Millspaugh 1418* (F). JAMAICA: *P. Browne* (LINN *996-2*); *"Sonchus agrestis", Swartz* (S); Castleton Hill, July 1900, *Fawcett 8024* (F); Castleton, April 1910, *Harris 10890* (F, K). HAITI: Dept. du Sud, prope Civette, June 1917, *Ekman H-221* (S); Massif de la Selle, Croix des Bouquets, Terrelonge, March 1927, *Ekman H-7810* (S). DOMINICAN REPUBLIC: Sto. Domingo City, ad Rio Ozama, Jan. 1929, *Ekman 11374* (S, very large leaves with broad amplexicaul bracts); vicinity of Santiago, near La Cumbre, Jan. 1946, *Allard 14587* (S); *Voiteau* (FI). PUERTO RICO: Wydla, 1825,—(FI); Mayagüez, Oct. 1881, *Sintenis 164* (K); Cayey, in monte Llano, Sept. 1885, *Sintenis 2412* (F); prope Bayamon, Feb. 1888, *Stahl 865* (S). ST. THOMAS: Riedlé (FI); St. Peter, Jan. 1881, *Eggers 209* (K). ST. CROIX: "Spray garden", July 1896, *Rickseckler 474* (F). GUADELOUPE: "E. hieracifolia Rafin. Guadaloupe" (K). GRENADA: Vendome, St. George's, May 1905, *Broadway* (F). TOBAGO: April 1913, *Broadway 4463* (S); Mason Hill near the river, May 1913, *Broadway 4507* (F); Caroni swamp, July 1931, *Williams 12579* (K).

SOUTH AMERICA. FRENCH GUIANA: Acarouany, 1854, *Lagotz* (S). DUTCH GUIANA [SURINAM]: Upper Sipoliwini R., March 1936, *Rambouts 544* (K, 2). BRITISH GUIANA: Hyde Park, Demerara, May 1922, "Wild cotton for cooling the blood of children as well as of adults", *Warren* (F); Pomeroon, Jan. 1923, *De la Cruz 2947* (F); Kabakaburi, Feb. 1923, *ibid. 3293* (F); Northwest district, Waini River, April 1923, *ibid. 3756* (F); *Jenman 1496* (K). VENEZUELA: Montevideo, Caracas, March 1937, *Legrand 1061* (F); Bolivar, Gran Sabana, Oct. 1944, *Steyermark 59280* (F). COLOMBIA: Magdalena, near Lake Zapatoza, Aug. 1924, *Allen 277* (K); Santa Marta, *Smith 666* (F, S). Chocó: Playa de Togoromá, June 1944, *Killip & Cuatrecasas 39075* (F). Valle: Rio Colima, La Trogita, 1944, *Cuatrecasas 16502* (F). Cauca: la Paila, 1853, *Helton 384* (K); Popayán, *Lehmann 5224* (K), *Lehmann 7598* (F, K), *Lehmann 7985* (F); ad pag. El Tambo, June 1938, *von Sneidern 1535* (S). Tolima: Ibagué *Andrè K 262* (K). Meta: Villavicencio, Dec. 1928, *Apolinar-Maria 427* (F). Vaupés: Bocas del Carurú en Casa Alvarez, Sept. 1939, *Cuatrecasas 7009* (F). PERU. Loreto: Lower Rio Nanay, May 1929, *Williams 282* (F); Caballo-Cocha on Amazon River, Aug. 1929, *Williams 2489* (F). Ambo, 7000 ft., April 1923, *Macbride 3158* (F). Amazonas: Chacapayas, *Matthews* (K). Piedra Grande: estación near Rio Santo Domingo, *Macbride 3673* (F). Junin: Satipo, Aug. 1945, *Soukup 2841* (F). BOLIVIA. Reyes: Rurrenabaque am Rio Beni, 1930, *Fleischmann 147* (S). La Paz: Apolo, April 1902, *Williams 182* (K). "Nord-Yungas", Milluguaya, Dec. 1917, *Buchtien 4072* (F). "Sud-Yungas: Sireapaya bis Yoinacachi", Dec. 1906, *Buchtien* (W). Santa Cruz: Buena Vista, July 1924, *Steinbach 6208* (K). Larecipa: "viciniis Sorata, Canale Challapampa riv.", 1860, *Mandon 117* (K, det. as *E. ambigua* DC.; S). Casana im Tipuani-Tal, Sept. 1922, *Buchtien 7589* (S). BRAZIL. Amazonas: Taperinha bei Santarem, July 1927, *Ginzberger 412* (F). Para: Bõa Vista on Tapajós River, 1929, *Dahlgren & Sella 137* (F); Belém, Instituto Agronomica do Norte, Oct. 1942, *Blake 7755* (K). Pernambuco: Tapera, Sept. 1931, *Pickel* (F, MICH). Bahia: "Bahia in convallibus humidis" (W). Goias: near Villa de Arrayas, *Gardner 3868* (K, 2, syntypes of *E. sulcata* Gardn.). Minas Gerais: Caldas, 1845, *Widgren 211* (S, 2); Lagoa Santa, Nov. 1864, *Warming* (S, 2). Rio de Janeiro: in locis humidis, Dec. 1831, *Riedel 230* (P); road between Alto de Serra and Meio de Serra, Dec. 1928, *Smith 1551* (S). São Paulo: Campinas, March 1900, *Novaes 134* (US). Paraná: Curityba, Feb. 1904, *Dusén* (S); Ponta

Grossa, March 1904, *Dusén* (S); Iacarehý, Sept. 1908, *Dusén 6583* (S); Jaguariahyva, June 1914, *Dusén 15110* (S). Rio Grande do Sul: pr. São Martinho, Apr. 1893, *Malme 826 G* (S); Ijuhy, April 1893, *Malme 746* (S); São Leopoldo, 1941, *Eugenio 63* (F). PARAGUAY: Chaco-y pr. Concepción, *Hassler 7267* (S); in viciniis Caaguazú, Feb. 1905, *Hassler 8886* (K, S); "Villa River," *Jörgensen 3512* (F, S); *Hassler 1405* (K); "in Paraguay legit *Fleischer*" (P). ARGENTINA. Jujuy: Quinta, prope Laguna de la Brea, June 1901, *Fries 100* (S); Rio Grande, Feb. 1924, *Venturi 3418* (US). Tucuman: April 1928, *Venturi 6095* (F). Sierra de Cordoba: March 1876, *Hieronymus 499* (F). Misiones: Posadas, prope "La Granja", Nov. 1907, *Ekman 1106* (F, S); Apostales, San Jose, Feb. 1946, *Bertoni 2722* (F). URUGUAY: Dept. de Colonia, Riachuclo, Charca, April 1935, *Cabrera 3319* (S, several plants; most southerly specimens seen).

ASIA. CHINA: Kwangsi, Shang-sze Dist., Shap Man Taai Shan, May 1933, *Tsang 22219* (BM, GH, S). SIAM (all det. as *Gynura malasica* Ridl.); Surat, Panam, March 1927, *Kerr 12413* (K); Kurabi, Kao Sataw, *Kerr 12424* (K); Pattoni, Kao Kalakino, March 1928, *Kerr 14868* (K); Takinapa, Kapang, Feb. 1929, *Kerr 17551* (K); Kurabi, Tambur Kao Panom, April 1930, *Kerr 18830* (K). MALAYAN FEDERATION (all det. as *G. malasica*): Selangor, Kuala Lumpur, Damansara Road, Dec. 1920, *Ridley* (K); Negri-Sembilan, Bukit Tanga Pass, *Ridley* (K); Johore, Sungai Tukong, July 1930, *Spare F802* (K). BRITISH NORTH BORNEO: Myburg Prov., Sandakan, 1921, *Elmer 20159* (K, det. as *Sonchus arvensis*); Elphinstone, Prov. Tawau, *Elmer 20977* (S, K, det. as *Sonchus oleraceus*); Mt. Kinabalu, Marai Parai, 5500 ft., Sept. 1933, *Clemens 30243* (BM, GH). SARAWAK: Kuching, Jan. 1915, *Ridley* (BM, K); Rajang Rubber Estate, May 1929, *Clemens 5090A* (K). SUMATRA: Berastagi, Feb. 8, 1921, *Ridley* (K, det. by Ridley as "*Gynura aspera*, dwarf form"); Berastagi, open country, Feb. 10, 1921, *Ridley* (K, det. by Ridley as *Gynura aspera;* holotype?); East Coast, Loendoet Concession, Koealoe, May 1927, *Bartlett 7661* (NY, US); East Coast, vicinity of Loemban Ria, Asahan, 1935, *Rahmat Si Boeea 7395* (GH, US); Island of Siberoet, Sept. 1924, *Boden-Kloss 14556* (K). JAVA: Sindanglaja, May 1875; *Kuntze 4488* (NY); Sumbing Vulcan, Aug. 1875, *Kuntze 5578* (K; NY, 2); Gedeh, Tjibodas, Feb. 1897, *Möller* (S, right-hand specimen only; left is *E. valerianaefolia*).

Grisebach was apparently the first to propose combining all of the Caribbean material under *E. hieracifolia*, and to use differences in bracteole length to distinguish varieties. By considering length and width of phyllaries, length and number of calycular bracteoles, and general pubescence, he established three varieties, including the typical one. Unfortunately, the number of bracteoles, upon which he based the tropical varieties, is not consistent, even from capitulum to capitulum on the same inflorescence, even on the very specimens he cited. The description of var. *carduifolia* as glabrescent is not generally applicable, the description as pubescent or as setaceous, given by Cassini, Desfontaines, and de Candolle, being much more appropriate.

Despite the artificiality of his varietal limits, the epithets which Grisebach used for his varieties have clear priority in that rank, and at least one must be maintained. Since I could not locate any authenticated material of *Neoceis carduifolia*, I have taken up *cacalioides*. The epithet *agrestis*, although clearly the first unpreoccupied name to be applied to the tropical material, was used only in specific rank, where it has priority for those that might wish to continue to separate the temperate and the tropical states into different species.

Swartz described *Sonchus agrestis* from Jamaica.. There is no type in the strict sense, for Dr. Asplund informs me that there are two specimens of *E. hieracifolia* at Stockholm which were collected by Swartz in the West Indies but that the prin-

cipal annotations are by J. E. Wikström. I have examined both of these sheets, together with a third Swartz specimen labelled by Banks as *Sonchus agrestis* and now in the herbarium of the British Museum (Natural History). I at first believed that Swartz applied *Sonchus agrestis* to the smaller of the two specimens said to have been collected by him. This specimen, closely resembled by the one in London, has the phyllaries glabrous but only 7 or 8 in number, the bracteoles of the calyculus only 2 mm. long, and the leaves attenuate and non-amplexicaul at the base. These lesser specimens, however, do not have tomentose, or even sub-tomentose, branches, nor incised-serrate leaves, nor many capitula, as described by Swartz. Particularly because of their glabrous phyllaries and short bracteoles these lesser specimens must be the typical variety, with the more depauperate specimens of which they agree well. Although Swartz may have included some features of these lesser specimens in the amplified description in his later work, the name should be interpreted by the earlier diagnosis, which applies better to the larger specimen with the multicellular hairs and other features of var *cacalioides*.

Fischer in 1818 at Halle raised from Jamaican seed some plants to which he evidently gave the name of *Senecio cacalioides*. He appears to have sent a named specimen to Sprengel at Berlin, who gave it an excellent description in his account of the new introductions at Berlin and at Halle for that year. Although it is not clear if the specimen of "*Senecio cacalioides* Fischer, 1818" in Sprengel's herbarium is the one actually grown by Fischer, it agrees in every respect with Sprengel's description, particularly in being distinctly pubescent with multicellular hairs.

The fact that the Compositae of Sprengel's herbarium are in the Paris Herbarium seems not generally known, but is of considerable importance to the synantherologist, particularly in the interpretation of the "hort. berol." synonyms used by de Candolle now that the Compositae in the general herbarium at Berlin are destroyed. When Sprengel's collection was sold, the Compositae were bought by Schultz Bipontinus, whose collection of this family alone was said by Alphonse de Candolle[23] to have numbered 50,000 specimens. His collection, containing much type material, was in turn acquired by Cosson, and this eventually (after publication of "La Phytographie") by the Muséum d'Histoire Naturelle. Sprengel's sheets are identified by uniform tickets reading: "Sprgl.! herb. n. , _____ Syst. III, [page n.], n. ". I believe that these tickets are in the writing of Schultz, rather than that of Sprengel. This reduces their claim to authenticity, and I hesitate to cite these specimens as holotypes for names that originated with Sprengel, particularly those from publications which preceded the "Systema Vegetabilum". But for those specimens which I have examined the collation to page number, species number, and description in the "Systema Vegetabilum" is excellent. Link also attributed *Senecio cacalioides* to Fischer, but based his own description on a similar plant from Brazil. De Candolle later reduced Link's name to *Erechtites ambigua*, but wrongly, the latter actually being the petiolate form of *E. valerianaefolia*.

[23] La Phytographie. p. 450. 1880.

Sprengel first described *Sonchus occidentalis* as similar to S. *agrestis* Sw., but with glabrous peduncles and leaves. In the "Systema Vegetabilum" this was revised to very glabrous, in greater contrast with S. *agrestis*. Some authors have assumed that these descriptions therefore apply to those virtually glabrous specimens of var. *hieracifolia* which occur scattered throughout the West Indies. But the confusion surrounding this epithet has been removed by discovery of Sprengel's type, or at least an authentic specimen, in the Paris Herbarium. This specimen is not as glabrous as the descriptions indicate. With magnification the scattered stumps of multicellular hairs can be seen on the lower surfaces of the leaves and on the stem. The capitula have long calycular bracteoles which are ciliolate with multicellular hairs. This material of S. *occidentalis* thus belongs to the tropical variety. Rydberg apparently made a new combination in *Erechtites* for this species, for Degener has used this name on tickets on certain of his collections of *Erechtites* from Hawaii, attributing the combination to "Rydberg in herb". On comparing these and other Hawaiian sheets with Sprengel's specimen, I find that the Hawaiian material uniformly has glabrous phyllaries, very short calycular bracteoles, peduncular bracteoles less than one-half the length of the involucre, and no multicellular pubescence on either type of bracteole. These characters exclude it from *E. hieracifolia* var. *cacalioides*, and place it in var. *hieracifolia* instead.

Erechtites hieracifolia is represented in the Orient, however, by var. *cacalioides* only, and appears to be neither widely distributed nor abundant there. Most of the specimens from this region which are so determined have proved actually to be the African *Crassocephalum crepidioides* (Benth.) S. Moore. The two are readily distinguishable, the latter by the longer style-arm appendages, small dark-red achene, lyrately pinnatifid and petiolate lower leaf, and usually lacking pistillate marginal florets. Merrill [24] fell victim to this confusion when he wrote: "Two species of the American *Erechtites*, both with pink flowers, may be dominant wherever they have been introduced, *E. hieracifolia*, fig 185A, and *E. valerianaefolia*, fig. 185B." True *E. hieracifolia* never has pink florets, whereas *C. crepidioides* does, as numerous specimens of it incorrectly determined by Merrill as *E. hieracifolia* testify. As for the figures cited, fig. 185A is certainly *E. valerianaefolia* (instead of *E. hieracifolia* as stated), with its characteristic pinnatisect leaf, whereas fig. 185B is *C. crepidioides* but shows only the subentire foliar leaves. Merrill is of course by no means alone in this misapprehension, as it is evident in nearly all of the herbaria which I have studied.

Grisebach reported *E. hieracifolia* var. *hieracifolia* from Mauritius, based, I believe, on two specimens at Kew. One is ticketed: "*Senecio?* fl. roseo. Growing in high mountains, Mauritius. *Senecio cacalioides* Bojer. H. M. 188, *Erechthites hieracifolia* Raf.". This proved to be *Crassocephalum rubens* (Jacq.) S. Moore. The other specimen, simply labeled "Telferin. Mauritius", and determined as *E. hieracifolia*, was immature and poorly pressed, but appeared to be *Crassocephalum sarco-*

[24] Plant Life Pacific World, p. 143. 1945.

basis (Bojer) S. Moore, *vel aff.* I have yet to see *Erechtites* from Mauritius, Madagascar, or vicinity.

These two major varieties of *Erechtites hieracifolia* are not absolutely distinct; quite possibly they intergrade where their ranges overlap in the Caribbean basin. Occasional specimens of tropical material have the calycular bracteoles rather shorter than usual or have longer calycular bracteoles which are on first inspection apparently devoid of multicellular pubescence. Occasional temperate-zone specimens occur in which calycular bracteoles approach the length which characterizes the tropical variety. Nature continues to defy our pigeon-holes.

Several subsidiary considerations, in my experience, may help establish or confirm the varietal determination in such cases. The width of the calycular bracteoles is usually greater in var. *cacalioides* than in var. *hieracifolia*, to as much as twice as wide, even in bracteoles of the same length. In determining the length of the bracteoles the most reliable measurements can be obtained on capitula which have fully elongated but have not yet begun to expand the floret buds, as during anthesis the bracteoles begin to flex. By fructescence they are quite often both strongly flexed (and thus apparently shorter) and appreciably withered. The lateral expansion of the receptacle which normally occurs during maturation of the achenes also tends to distort the ratio between calyculus and involucre.

Care should be taken in examining younger parts of the inflorescence, to distinguish between members of the calyculus proper, whose insertions are always upon the expanded torus, and the bracteoles of the peduncle and the bracts subtending the peduncles. Either of the last two may, before the peduncle is fully elongated, overlap the calyculus and appear to be a part of it. It is also true, though, that both of these structures tend to be longer in var. *cacalioides* than in var. *hieracifolia*. Indeed, length of these parts may be a helpful secondary characteristic if the peduncles are fully elongated, although a less reliable one than length of the calyculus.

Short multicellular hairs may occur occasionally on the stems and leaves of var. *hieracifolia*, and indeed do so on the Linnaean lectotype, and often occur abundantly on the stem and leaves of var. *megalocarpa*. But I have not yet observed any occurring on the inflorescence of any truly temperate-zone specimen, not even on those Gulf Coast specimens which have the long bracteoles of the Caribbean variety. I therefore conclude that any specimen with even remnants of multicellular hairs in the inflorescence is var. *cacalioides*.

2. ERECHTITES VALERIANAEFOLIA (Wolf) DC. Prodr. 6: 294. 1838.

Senecio valerianaefolius Wolf, Ind. Sem. Hort. Berol. 1825, *teste* Reichenb. Icon. Bot. Exot. 59, *tab.* 85. 1827.

Annual; stem herbaceous, subsimple to much branched above, glabrous or occasionally sparsely hispidulous, striate, 0.5 to 1.0 (to 2.0 or more) m. high. Lowest leaves petiolate, ovate-lanceolate to lanceolate, entire or serrate to irregularly dentate; medial leaves petiolate with narrowly decurrent wings, very deeply pinnately lobed, the lobes lanceolate and serrate to irregularly incised-dentate, or pinnatisect with linear segments entire or minutely serrulate, or entire or subentire

like the lower leaves; upper leaves similar to the medial leaves but slightly reduced in size upward, or sometimes abruptly reduced several nodes below the inflorescence. Inflorescences terminal and axillary, forming a rather congested cymose panicle. Capitula slender, at anthesis about 10 mm. long, 3 mm. wide, scarcely ventricose, with linear calycular bracteoles extending to one-fourth or one-third the height of the involucre; involucre of 12 to 14 (to 16) phyllaries; phyllaries 7 to 8 mm. long, 0.5 to 0.75 mm. wide, linear and acute to acuminate, with keel flat and 4- or 5-nerved, glabrous or rarely minutely hairy; marginal florets uniseriate or subbiseriate, corolla 5-fid, with lobes 0.5 mm. long and 0.2 mm. wide, apices glandulose-thickened and incurved; style-arm apices shortly conic-appendaged. Disc florets more numerous than the marginal, the outer ones transitional in size and shape, with corolla 7 to 8 mm. long, only slightly longer and more dilated than the pistillate florets, the inner ones with corolla slightly longer and larger, slender, infundibuliform, 5-fid, with lobes 0.5 mm. long and 0.2 to 0.35 mm. wide, their apices glandulose-thickened; style-arm apices with conical appendage approximately 0.05 to 0.1 mm. long. Achene cylindric, 2.5 to 3.5 mm. long, with about 10 heavy, pale brown ribs, dark brown and entirely glabrous to minutely villous or hispidulous in the grooves. Pappus multiseriate, slender, rose-lilac to very pale reddish, rarely nearly or quite faded to white, subequalling the florets, exceeding the phyllaries.

Widespread in tropical America, where it sometimes hybridizes with *E. hieracifolia* var. *cacalioides;* adventive as an aggressive weed into tropical Asia, many of the Pacific islands, and northern Australia.

Separable on the basis of differences in the foliage into four fairly well-marked forms.

KEY TO THE FORMS

A. Medial and upper cauline leaves pinnatisect or subpinnate ..... B
B. Leaves only slightly reduced in size upward below the inflorescence C
C. Segments of the strongly pinnatisect leaves lanceolate, broad, serrate to incised-dentate ..... 2a. f. *valerianaefolia*
CC. Segments of the pinnatisect leaves linear, entire or minutely serrulate..... 2b. f. *organensis*
BB. Leaves abruptly and markedly reduced in size several nodes below the inflorescence ..... 2c. f. *reducta*
AA. Medial and upper cauline leaves entire or subentire ..... 2d. f. *prenanthoides*

2a. Erechtites valerianaefolia f. valerianaefolia

Senecio valerianaefolius Wolf, Ind. Sem. Hort. Berol. 1825, *teste* Reichenb. Icon. Bot. Exot. 59, *tab.* 85. 1827; Link *ex* Spreng. Syst. Veg. 3:565. 1826.

Senecio valerianaefolius Desf. Cat. Hort. Paris. ed. 3. 178, 403. 1829; by descr. florets all perfect, a discoid *Senecio,* but type (FI ex Hb. Desf. !) has marginal florets pistillate.

Crassocephalum valerianaefolium (Wolf) Less. Linnaea 5:163. 1830; Syn. Gen. Comp. 395. 1832.

Sonchus erythropappus Meyen & Walp. *ex* Walp. Nov. Act. Acad. Caes. Leop. Nat. Cur. 19, Suppl. 1: 293. 1843.

Senecio valerianaefolius Gardn. Lond. Jour. Bot. 4: 127. 1845.

Gynura rosea Ridl. Jour. Str. Br. Roy. Asiat. Soc. 61: 25. 1912.

Erechthites Gardneriana Cabr. Brittonia 7: 54. 1950.

Neotype: "Senecio valerianaefolius ex. h. Raffeliano, 1825" (W, "collectio Reichenbach fil., aqu. 1889, no. 16256"!).

Medial cauline leaves 5 to 20 (to 30) cm. long, 2 to 8 (to 15) cm. wide, strongly pinnatisect or subpinnate with narrowly winged rachis; segments 3 to 7 on either side, broadly lanceolate, coarsely and irregularly serrate to incised-dentate, sometimes basally sublobulate.

Widely distributed from Central Mexico to Brazil and Argentina, rare in the Lesser Antilles; adventive in Southeastern Asia, the East Indies, Philippine Islands, New Guinea, Queensland, Fiji Islands, Samoan Islands, Hawaiian Islands, and elsewhere in the Pacific as an aggressive weed.

CENTRAL AMERICA. MEXICO: Vera Cruz, recent clearings near Jalapa, *Pringle 8334* (BM, F, S, W); Chiapas, Pinales, Siltepec, 1938, *Matuda 1971* (MICH); Mt. Tacana, Aug. 1938, *Matuda 2451* (MICH); *MacDaniels 861* (F). GUATEMALA: Alta Verapaz, Cobán, Nov. 1907, *von Türckheim II 1396* (F, S). EL SALVADOR: Ahuachapán, vicinity Apaneca, Jan. 1947, *Standley & Padilla 2928* (F); *Carlson 969, 3939* (F). HONDURAS: Morazan, *Standley & Molina 4138* (F). NICARAGUA: Summit of Mt. Mombacho, near Grenada, *Grant 829* (F); Jinotega, *Grant 7303* (F); *Tate 181 (485)* (BM); *Standley 10619* (F). COSTA RICA: San José, vicinity of El Géneral, July 1936, *Skutch 2751* (MICH, S); San Loié, 1853, *Scherzer* (W). PANAMA: *Allen 1367* (F); *Davidson 528* (F).

WEST INDIES. PUERTO RICO: headwaters, Inabón River, Jan. 1941, *Otero M-111* (MICH). LEEWARD ISLANDS: Montserrat: Fergus Mtn., Jan. 1907, *Shafer 333* (F). WINDWARD ISLANDS: Dominica: *Hodge 777* (BM).

SOUTH AMERICA. VENEZUELA: *Vogl 475* (F); *Moritz 340* (BM). COLOMBIA: Santa Marta, *Smith 508, 664* (BM, F, S). ECUADOR: *Rimbach 277* (F). PERU: Aug. 1854, *Lechler 2461* (W, 2). BOLIVIA: Hacienda Simaco sobre el camino a Tipuani, Feb. 1920, *Buchtien 825* (BM, F, S); Mapiri, April 1886, *Rusby 1671* (BM, MICH); *Bang 2068* (F, MICH, W; not BM, which is f. *organensis*). BRAZIL: Bahia, *Blanchet* (W); Bahia in humidis, *Salzman* (G Prodr., FI); Bahia, 1842, *Glocker 17* (US, S). Minas Gerais: Caldas, March 1875, *Regnell I 272* (S, 3; a fourth sheet dated 1866-67 is f. *prenanthoides*); Viçosa, Agricultural College lands, March 1930, *Ynes Mexia 4415* (BM, F, MICH, S). Rio de Janeiro: "in montosis," 1832, *Lund* (G Prodr.); ad aquas circa Rio de Janeiro, *Pohl 646* (W); Organ Mts., open bushy places, 3000 ft., *Gardner 522* (K, diseased, type of S. *valerianaefolius* Gardn.). São Paulo: Campinas, Oct. 1904, *Heimer 228* (S). Paraná: Passo, March 1904, *Dusén* (S); Iacarechý, Aug. 1914, *Dusén 15351* (F, S). Santa Catarina: *Mueller 454* (K). Rio Grande do Sul: Canôas pr. Pôrto Alegre, Nov. 1892, *Malme 298* (S, 5) Ijuhy, April 1893, *Malme 750* (S, 4); São Leopoldo, Oct. 1936, *Dutra 1401* (S). PARAGUAY: Villarrica, *Jörgensen 7489* (F, S); San Bernardino, *Hassler 3625* (BM, W); "ad ripas Paraguay", Jan. 1873, *Gilbert 1066* (K, stem flexuous); *Hassler 11815* (BM); *Fiebrig 634* (F). ARGENTINA: Misiones, Posadas, Nov. 1907, *Ekman 1103* (F, S); S. José dos campos, Aug. 1909, *Löfgren 299* (S).

ORIENT. JAPAN: Hachijoo Island, Mitsume-mura, Dec. 1948, *Shigetake Suzuki, Plantae Japonicae 391088* (GH), Jan. 1949, *ibid.* (US). CHINA: Hainan, Sha po Shan, Taai Shui ravine, Aug. 1927, *Tsang 682* (NY, US); Yaichow, 1933, *How 70622* (GH, NY, US); S. W. Seven Fingers Mtn., April 1932, *Liang 61669* (F, GH, NY); near Tau Ti P'o, April 1922, *McClure 9128* (NY); Tam dist., S. of Fan Ta, May 1929 *Tsang & Fung 223* (NY); Taam-Chau dist., Nodoa, July 1927, *Tsang 110* (NY, US). MALAYAN FEDERATION: Pahang, Cameron Highlands, April 1937, *Henderson 32659* (GH). (Numerous other specimens from the Malay States, many collected by Ridley and determined as *Gynura rosea* Ridl., observed at Kew and the British Museum, by oversight were not listed). SUMATRA: Karo Highlands, Berastagi, June 1928, *Hamel 428* (GH, NY); vicinity of Rantau Parapat, Bila, 1932, *Rahmat Si Toroes 1716* (NY, US); Adian Rindang, Asahan, 1935, *Rahmat Si Boeea 8842* (GH). JAVA: "Java (iter javanum secundum)", *Zollinger 2658* (G Deles., P); "ad rivulos pr. Gadok, 1600 ft., 12 Nov., 18—," *Zollinger I 3655* (W, 2); Magamendon, May 1875, *Kuntze 4407* (NY); Gedé, May 1875, *Kuntze 4807* (NY); Preanger Prov., Tjiboeroem, forested middle slopes of Mt. Gedé, April 1909,

Palmer & Bryant 197 (US). SARAWAK: without locality, *native collector 727* (US). BRITISH NORTH BORNEO: Mt. Kinabalu, Penataran River, July 1923, *Clemens 34047* (GH). REPUBLIC OF THE PHILIPPINES: Luzon: Sorsogon, Irosin, Mt. Bulusan, Dec. 1915, *Elmer 15364* (F, GH, NY, S, US, W). Catanduanes: 1917, *Ramos 30251* (US). Samar: Catubig River, 1916, *Ramos 24422* (US). Negros: Negros Oriental, Sibulan, Malangco So., Sept. 1948, *Edaño 6799* (GH). Balut Island, Oct. 1906, *Merrill 5412* (NY, US). Mindanao: Todaya (Mt. Apo), Davao, May 1909, *Elmer 10463* (F, NY, US); Agusan, Cabadbaran (Mt. Urdaneta), Aug. 1912, *Elmer 13580* (F, GH, K, NY, US); Bukidnon, vicinity of Tanculan, July 1916, *Fenix 24936* (US); Cotabato, Nutol, 1932, *Ramos & Edaño 84871* (GH). CELEBES: "P. Boeton: Kaboengka", Feb. 1929, *Kjellberg 238* (S). NEW GUINEA: (N. E., Morobe, bei Salamaua, Malalo Mission, Nov. 1936, *Clemens*, cited by Mattfeld, Engl. Bot. Jahrb. 38:288). AMBOINA: Soja, Aug. 1913, *Robinson 1836* (NY, US).

OCEANIA. AUSTRALIA. Queensland: Beaudesert, April 1907, *Boorman* (NSW); Eumundi, March 1915, *White* (NSW); base of Mt. Gravatt near Brisbane, Nov. 1930, *White 6856* (NY). New South Wales: Billinudgel, May 1911, *Stephenson 3* (NSW); Hat Head, Jan. 1953, *Constable* (NSW); Durimbal to Berkeley Vale, Oct. 1953, *Salasoo* (NSW). SOLOMON ISLANDS: Guadalcanal, east fork of Tenam Riv., Aug. 1945, *Riley 16* (US). FIJI ISLANDS: Vanua Levu, Thakaundrove, hills south of Nakula Valley, Nov. 1933, *Smith 333*, Viti Levu, Mba, summit of Mt. Koroyanitu, May 1947, *Smith 4194* (US). SAMOAN ISLANDS: Upolu, Vailima, Aug. 1905, *Rechinger 769* (NY, W); Upolu, Launtoo, Aug. 1905, *Rechinger 1844* (W, 3). HAWAIIAN ISLANDS: Hawaii, Kilauea region, July 1929, *Degener* (NY); Oahu, Tantalus Mt., Honolulu, June 1923, *Degener 1519* (NY); Lanai, Kalulu, March 1916, *Munro 534* (NY); West Molokai, Hauakea Pali, April 1928, *Degener 18133* (NY); Maui, east of Plinda, Oct. 1916, *Hitchcock 14924* (US).

CULTIVATED: *"Senecio valerianaefolius* Link, Hort. Berol." (W); *"Senecio valerianaefolius* h. p." (FI, ex Hb. Webb. ex Hb. Desf., type of *S. valerianaefolius* Desf., marginal florets 4-fid, pistillate).

There is some question as to who actually authored the 1825 seed list, whether Wolf or Link, and this I have been unable to establish. Every effort to locate a copy of this list has so far been unsuccessful. I have been unable to learn even whether the first appearance of the name was accompanied by a description or not. If not, then the first description is the brief but sufficient paragraph by Sprengel, and the citation would be "Link *ex* Sprengel." But Reichenbach and Lessing, who cite Sprengel, both credit the name to Wolf. Therefore I accept Wolf as the original author pending finding of the 1825 seed list. The sheet, *"Senecio valerianifolius* ex h. Raffeliano, 1825," is in very excellent detailed agreement with Reichenbach's description, and appears to be the original from which his pl. 85 was prepared. In view of the reported destruction of any type material there may have been of this species in the Berlin Herbarium, I designate this sheet as neotype.

Gardner gave his *S. valerianaefolius* the number *252* in the 'London Journal,' but the corresponding specimen at Kew is *Gardner 522*, Organ Mts., Brazil. It is a monstrous specimen with the capitula mostly much distorted as if by an infection. (The symptoms are very similar to, if not identical with, those produced by the aster yellows virus.) A few capitula at the apex of the inflorescence are fairly normal, however, and show the typical structure of *E. valerianaefolia*, including pistillate marginal florets and a faintly colored pappus. The leaves are quite typical of f. *valerianaefolia*. Gardner's proposed species, which is really not valid anyway since it is based on a monstrosity, thus reduces to *E. valerianaefolia* f. *valerianaefolia*.

Erechthites Gardneriana Cabrera, based on it, is therefore superfluous.

Lessing transferred *S. valerianaefolius* Wolf to *Crassocephalum*, as emended and greatly extended by himself. It is true that the appendage of fused papillose hairs which terminates the style arm of *E. valerianaefolia* is somewhat longer than that of *E. hieracifolia*, and might be taken to indicate intermediacy between the latter species and the widespread *Crassocephalum crepidioides*. The heavily ribbed brown achene of *E. valerianaefolia*, however, is scarcely or not distinguishable from that of *E. hieracifolia*, whereas the characteristic achene of *Crassocephalum* is shorter, more uniformly cylindric, weakly ribbed and short-haired on the ribs, and reddish in color. The florets of *Crassocephalum* are tubulous, rather than filiform, and are more coarsely lobed.

2b. ERECHTITES VALERIANAEFOLIA f. **organensis** (Gardn.) Belcher, comb. nov.

Erechtites organensis Gardn. Lond. Jour. Bot. 7: 420. 1848.
Erechthites valerianaefolia var. *organensis* (Gardn.) Baker, Mart. Fl. Bras. 6^3: 300. 1884.

Differing from the typical form in having the leaves very finely divided, the segments entire or only minutely serrulate; plants usually of small stature.

Holotype: Brazil, Rio de Janeiro, "open bushy places on the Organ Mountains, 3000 ft., March 1841", *Gardner 5790* (BM!).

Known only from subtropical Brazil and Bolivia.

BRAZIL: Paraná: Ypiraugá Feb. 1904, *Dusén* (S); São João, March 1910, *Dusén 9349a* (BM, K, S). Minas Gerais: Marianne, 1833, *Vauthier 306* (G Prodr.); Caldas, 1845, *Widgren 210* (S, 2); Caldas, Feb. 1875, *Regnell III 794* (S, 3). BOLIVIA: *Bridges* (BM); *Bang 2068* (BM; not F, K, which are f. *valerianaefolia*).

In addition to the finely divided leaves, Gardner's species was characterized by its hairy stem, smaller capitula, and shorter achenes, hispid instead of villous. The hairy stem is frequently found in f. *prenanthoides* and not uncommonly in f. *valerianaefolia* from widely scattered parts of its range. As for the smaller capitula, those of *Gardner 5790* have the phyllaries 7.5 mm. long, not 9 mm. as given by Gardner, but other specimens of f. *organensis* exceed this while numerous specimens of f. *valerianaefolia* closely approach it, so that there seems to be no useful discontinuity. Moreover, I have yet to see a truly villous achene, such as Gardner ascribed to *E. valerianaefolia*, anywhere in the genus *Erechtites* proper.

Although of the three non-typical forms of the species this one comes closest to having a distinct geographical range, it does not replace the typical state within that range but occurs with it as a comparatively minor element. Nor is the morphological distinction by which it is recognized a very great one. For these reasons this taxon is better given the status of a form. Hasskarl[25] arrived at a similar conclusion more informally: "Misschien is *E. organensis* Grnd. [sic!] (Wlp. Rep. II. 906. 2) niets, dan eene oude of magere vorm." There remains, of course, the possibility that it is ecologically very distinctive, but this can not be decided on the basis of the very meager information which accompanies the material cited.

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[25] Verh. Meded. Kon. Akad. Wet. 5:100. 1857.

The type was obtained at an elevation of 3000 feet in a brushy opening on the mountain, whereas Dusén collected it in the Paraná Valley in swampy places at unspecified elevations not more than three hundred miles further south (but a greater distance westward). Nothing is stated about the habitat of the specimens from Bolivia.

2c. ERECHTITES VALERIANAEFOLIA f. **reducta** Belcher, forma nova.

Folia 4 vel 5 superiora abrupte reducta, circa 2 cm. longa et 1 cm. lata, sessilia, pinnatifida, segmentis utrimque 4-6, lanceolatis; folia ad caulis mediam 8-10 cm. longa, 3.5-5 cm. lata, subpetiolata, inaequaliter dentata seu lobata, lobis distinctis plerumque 2 vel 3, raro 4.

Specimina typica (syntypi 2) legit Dusén (n. 14156) in Brasilia, Paraná, prope Antonia opp. in locis ruderatis, 29 Aug. 1912 (S!).

Differs from the typical form by the upper leaves being sessile, markedly reduced in size for several nodes below the inflorescence to as little as 2 cm. long and 1 cm. wide, deeply pinnatifid, with 4 to 6 lanceolate lobes on either side, often much more dissected than the median cauline leaves, which seldom have more than 2 or 3 distinct lobes per side but are 8 to 10 cm. long and 3.5 to 5 cm. wide and subpetiolate. The plants are simple below the inflorescence and of somewhat reduced stature, 40 to 70 cm. tall. Capitula are comparatively few. Occurs in southern Brazil; also Mindanao, Philippine Islands, and has been in cultivation.

BRAZIL: Rio de Janeiro [?], *Gardner 5528* (BM); Bahia, *Lockhart* (BM); Ceará, June 1929, *Bolland* 39 (K). PHILIPPINES: Mindanao, Camaguin, 1912, *Ramos 14452* (US). CULTIVATED: "*Senecio valerianaefolius* H. P., J. de Paris, 1828" (G Prodr.); "*Erechthites valerianaefolia* DC.", ex hort. bot. Petropolitano (K, US).

This well-marked foliage state has never been described previously, as far as I can discover. From the limited number of specimens of this form among quite numerous specimens of *E. valerianaefolia*, it would seem to be very infrequent in the field. Because of its comparatively small stature, it would seem rather more likely to be collected by the casual collector, who often selects individuals of a size easily pressed, than the somewhat larger and more succulent f. *valerianaefolia*. I am unable to establish any valid pattern of distribution from the limited material seen so far. This interesting form might well be the object of careful attention from collectors, in order to extend the data on distribution and frequency. It should also be brought into cultivation along side the other forms for comparison and genetical analysis.

The very diffuseness of distribution, as indicated by the quite characteristic specimen from Mindanao, suggests that this form may simply be the product of a recurring mutation. That it is fertile is implied by the two plants from the Petrograd garden, which are presumably of the same progeny, and also by the two specimens from Antonina, Paraná. Both sets imply that there might be populations.

2d. ERECHTITES VALERIANAEFOLIA forma **prenanthoides** (Kunth) Cuatr. in herb., comb. nov.

Cacalia prenanthoides Kunth in HBK. Nov. Gen. & Sp. 4:167. 1820, folio ed. 4: 131. 1820; *non* A. Gray, Proc. Amer. Acad. 19: 53. 1883.

Erechtites ambigua DC. Prodr. 6: 295. 1838, excl. syn.; *non* Sch. Bip. Bull. Soc. Bot. Fr. 12: 80. 1865.
Erechthites petiolata Benth. Pl. Hartw. 209. 1845. Type: Popayań, *Hartweg 1160* (K!).
Senecio albiflorus Sch. Bip. Flora 28: 498. 1845.
Senecio lactucoides Klatt, Leopoldina 24: 125. 1888.
Erechthites prenanthoides (Kunth) Greenm. & Hieron. *ex* Hieron. Engl. Bot. Jahrb. 29: 63. 1900; *ibid* 28: 628. 1901, Type, Popayán, *Lehmann 5665* (K!); *non* DC. Prodr. 6: 296. 1838.

Differs from the typical form in having all the leaves comparatively smaller, more or less petiolate, undivided, either merely serrate or at most the upper ones pinnately incised on the basal portion only; stem sparsely setaceous-hispid, leaves more or less scurfy-pubescent on the nerves beneath.

Syntypes: *"Cacalia prenanthoides", Humboldt & Bonpland* (P, 2 sheets, in Herb. Humb. & Bonpl.!).

Of sporadic occurrence over much of the range of forma *valerianaefolia.*

BRAZIL: *Sellow* (G Prodr., holotype of *E. ambigua* DC.). Rio Grande do Sul: Cruz Atta, April 1893, *Malme 776* (S, 2). Paraná: São João, March 1910, *Dusén 9349* (S, 2). Minas Gerais: Lagoa Santa, *Warming* (S); Caldas, 1866-67, *Regnell I 272* (S, complete plant, this sheet only; others of this number with later date are typical form); Caldas, April 1874, *Mosén 1421* (S). COLOMBIA. Cauca: Popayán, *Silvio Yepes Agredo 328* (F); ad pagum El Tambo, June 1938, *von Sneidern 1531*, June 1939, *von Sneidern 2770* (S). Valle: Cordillera Occidental, Hoyo del Rio Cali, Pichindé El Abismo, *Cuatrecasas 18651* (F, 2). Cundinamarca: Salto de Tequendama, *Cuatrecasas 54* (F). Magdalena: Santa Marta, *Smith 2165* (K, lacking petioles); around San Andres de la Sierra, *Pittier 1711* (F); Santa Marta, Recuerdo, Nov. 1947, *Engstedt 84* (S). "Nouvelle Grenada", *Triana 2806* (BM). PERU: *Pennell 13982* (F). ECUADOR: Pichincha, Tandapi, July 1920, *Holmgren 825* (S); Tungurahua, Hacienda San Antonio pr. Baños, Dec. 1937, *Sydow 575* (S); Eastern Cordillera, valley of River Pastaza, *Rimbach 492* (S); *Camp E-4275* (F). MEXICO: Vera Cruz, *Galeotti 2242* (K, G Deless.).

CHINA: Kwangtung, Kao-Yao Dist., Ting Woo Shan, beside stream, July 1932, *Lau 20160* (NY). HAINAN: Kau-en Dist., Chim Fung Ling, near Sam Mo Watt village, April 1934, *Lau 3870* (S, right only, left is typical form). SAMOA: Savaii, Safune, in rain forest along trail, May 1924, *Bryan 121* (NY).

MATERIAL EXCLUDED: Of the several numbers of *Elmer* widely distributed as *E. petiolata* all that I have seen are small states of f. *valerianaefolia* with the petiolate entire lower leaves carried upward higher than usual, but with the upper leaves distinctly pinnatifid. *Mandon 117* (K) det. as *E. ambigua* is *E. hieracifolia* var. *cacalioides.*

The Humboldt & Bonpland specimens are cited as syntypes because Kunth included both in his description, as indicated by the two measurements given, "sesqui- aut bipedalis". One specimen is 18 inches long, the other totals 22 inches in two pieces. Kunth's careful description of the leaves as petiolate, lanceolate-oblong, pinnatifid-incised toward the base, and decurrent on the petioles, makes clear that this name applies to the taxon with petiolate subentire leaves. The place of collection of the type specimens, usually precisely stated by Kunth, is for this species given dubiously as "Nova Hispania?" There is nothing on either syntype to correct this or to confirm it, unless it be the number "20" which occurs on one of the labels. Since this form has been collected from Mexico by others, in the vicinity of Vera Cruz, it may be that Mexico is the type locality, although it appears to be much more frequently found in Colombia. Kunth called the plant

a perennial, even while confessing "folia radicalia ignota". It actually appears to be a strict annual.

Greenman and Hieronymus apparently were the first to recognize *Cacalia prenanthoides* as an *Erechtites*. They transferred Kunth's specific epithet to this genus, reasoning that since the name *Cacalia prenanthoides* (1820) was older than *Senecio prenanthoides* A. Rich. (1832), the combination *Erechtites prenanthoides* (A. Rich.) DC. must fall and be replaced by *E. Labillardieri* Hieron.! Greenman and Hieronymus appear to have overlooked the appropriately named *E. petiolata* Benth.

Erechtites ambigua DC. was reduced by Baker to *Erechtites hieracifolia*. This error apparently can be traced to a sheet laid in at Kew as the "type" of *E. ambigua*. This is *Mandon 117*, determined by Schultz Bipontinus[26] as *Erechtites ambigua* in the list of determinations of Mandon's plants. The sheet at Kew has four specimens on it, all being *E. hieracifolia* var. *cacalioides*. If Baker accepted this sheet as authentic *E. ambigua*, he was fully justified in the reduction, and, indeed, it seemed quite logical in the light of de Candolle's ambiguous description of the leaves, which actually approximate those of some states of *E. hieracifolia*, and the flat statement that the pappus was white, not purpurascent. Although the pappus in the exposed capitula on de Candolle's holotype of *E. ambigua* has faded to an off-white except where concealed by the phyllaries, the capitula in the packet have distinctly pinkish pappus hairs, and de Candolle's statement is inaccurate.

Asa Gray, on unspecified evidence, equated *Cacalia prenanthoides* with *Senecio runcinatus* Less. (*E. ? runcinata* DC.) and maintained Kunth's name as the proper designation for the latter. Lessing's species actually is a discoid homogamous *Senecio* with unappendaged style arms and must be maintained as a *Senecio*. Its corollas are reddish purple and do not agree at all with Gray's definition of *Cacalia* as white-flowered with deeply cleft corollas. *Cacalia prenanthoides* A. Gray is thus a later homonym of *C. prenanthoides* Kunth.

After I had established the above synonymy, I found a specimen in the herbarium of the Chicago Museum of Natural History, collected by Cuatrecasas in Colombia and determined by him as "*E. valerianaefolia* forma *prenanthoides*". Cuatrecasas considers that this petiolate state, which he finds to be characteristic of the paramos, is an ecological response to the peculiar sort of xerophytic environment found there, with intense insolation. I can not wholly agree with him, mainly because of those specimens, probably including Kunth's syntypes, which have been collected at lower elevations from distant and discontinuous points, but I am glad to acknowledge his previous recognition of the identity and subsidiary status of *E. prenanthoides* (Kunth) Greenm. & Hieron. *ex* Hieron. The possible ecological status of this form needs to be investigated in the experimental garden.

3. Erechtites missionum Malme, Kungl. Sv. Vet.-Akad. Handl. 32: 73. 1899, *excl.* var. *lanceolata* Chod. & Hassl. Bull. Herb. Bois. II, 3: 732. 1903.

Annual herb. Stem strongly sulcate, glabrous, much branched above, to 1 m. high (or taller), leafy. Leaves as much as 20 cm. long and 8 cm. wide, usually somewhat less, approximately three times as long as wide, petiolate with the petioles

[26] Bull. Soc. Bot. Fr. 12:80. 1865.

narrowly or not at all winged, ovate to subovate, acute to briefly acuminate, irregularly incised-serrate with acuminately callose teeth, glabrous or minutely hairy beneath, sometimes more or less pinnately lobed toward the base of the blade, with lobes long-triangular and directed forward with their principal veins diverging from the midrib at an angle from 45° to 60° and the sinuses rounded, the lobes numbering from one to four on each side. Inflorescences terminal and axillary cymose panicles, congested in bud, becoming diffuse at anthesis, glabrous or sometimes with minute tightly appressed simple hairs on juvenile parts; peduncles suberect and elongating to 2.5 to 5 cm. at maturity; bracts subtending the primary branches much reduced in size but similar in shape to the cauline leaves, bracts of the secondary branches filiform, bracteoles of the peduncles 2 to 4, linear, 2 to 5 mm. long. Capitula solitary, at anthesis about 15 mm. long including pappus hairs, about 5 mm. in diameter when pressed, ventricose; calycular bracteoles few, linear, much shorter than the involucre, glabrous or with minute simple hairs; involucre of 12 or 13 attenuate-subulate phyllaries 11 to 13 mm. long, 0.7 to 1.0 mm. wide at base, abruptly reduced to a width of 0.5 to 0.8 mm., then linear, acute, finely multinervate with nerves becoming indistinct toward the apex, glabrous or minutely hairy in bud. Pistillate marginal florets in two or three rows, sometimes with rudimentary stamens; corolla filiform, 9 to 10 mm. long, 5-fid, with slender, acute lobes 0.5 to 0.6 mm. long. Disc florets hermaphroditic, more numerous than the marginal; corolla slenderly infundibuliform, 11 to 12 mm. long, 5-fid; lobes 0.5 to 0.6 mm. long, slightly then abruptly tapered to an acute and slightly papillose-thickened apex. Style-arm apex briefly appendaged with a cone of fused papillose hairs which has a fringe of divergent hairs at its base in the hermaphroditic florets. Achene 2 to 2.5 mm. long, subcylindric, dark brown and puberulous between the ribs. Pappus niveous, exceeding phyllaries by about 2 mm. and equalling the florets.

Indigenous to the Paraná River Basin in Argentina, Paraguay, and Brazil; also known from isolated stations in Peru and Venezuela, an extension of the previously reported range.

BRAZIL: Rio Grande do Sul: Colonia Ijuhy, in "roças" nec non juxta vias in silvas, April 1893, *Malme 744* (BM, isotype; S. holotype, 3). Paraná: Cahnon, March 1910, *Dusén 9317* (S, *an E. valerianaefolia?*); Iacarehý, 1914, *Dusén 15271* (BM, F, S); Jaguariahyva, Nov. 1914, *Dusén 15899* (F, S); Tres Barras, Jan. 1916, *Dusén 17624* (S, very immature); Nova Galisia, Feb. 1916, *Dusén 17700* (S). PARAGUAY: Caaguazú, Nov. 1874, *Balansa 930* (K, a branch with pinnatifid leaves; G Deless., pinnatifid leaves on branches but subtending leaves similar to the type). ARGENTINA: Misiones: Posadas, Bonpland, April 1908, *Ekman 1104* (S). PERU: 1835, *Matthews 1739* (K). VENEZUELA: "prope coloniam Tovar", 1856-7, *Fendler 1972* (K); "Bajo Cotiza, en la sombra al lado de rio", Sept. 1940, *Vogl 417* (F).

This species is not easily distinguished from glabrous states of *E. hieracifolia*, the most usable characters being the nature of the leaf base and the length-width ratio of the leaf blade. Other characters, such as relative length and width of capitulum, number of florets, size of phyllaries, time of flowering, etc., are of little value because of variation in these features within both species. There is some

ground for suggesting that it is the South American equivalent of *E. hieracifolia* var. *hieracifolia*, and should be treated as no more than a variety. This possibility requires investigation by hybridization experiments and other such analyses, however, before it can be more seriously advanced. Until such studies have been made, the two species should be kept apart, although they are undoubtedly very closely related.

Judging from the rather meager ecological data on the tickets, this species is largely confined to the forest edge in rather moist situations. It is worth noting that altitudinally it ranges from near sea-level (below 200 m.) in the Paraná Valley at the southern end of its range at about 30° S. latitude, to well above 1000 meters in the Sierra Mérida of Venezuela, at about 8° N. latitude. What its altitudinal location in Peru may be is not indicated, but it is perhaps somewhat higher there, nearer the equator. It is very unlikely that the distribution of this species is as disjunct as these scattered records indicate. A search for it along the eastern foothills of the Andes on the edges of the forest openings and along trail-sides at about the 1000-meter contour from Venezuela to Peru and gradually descending southward to Bolivia and Argentina might establish many additional stations.

This species, aside from the original description, and the erroneous assignment to it of var. *lanceolata* by Chodat and Hassler (see below, under *E. goyazensis*), I have seen alluded to only once, by Cabrera[27]. This was merely a statement that it was one of four well-known species of *Erechtites* in Brazil.

Chodat and Hassler undoubtedly must have assigned *Hassler 8362* to *E. missionum* as var. *lanceolata* because of the resemblance of the capitula. But this resemblance does not extend to the florets nor to the leaves, whereas in both of these features there is detailed agreement between the several duplicates of *Hassler 8362* and the type of *E. goyazensis*. The variety is to be excluded from *E. missionum*.

§ GOYAZENSES

4. ERECHTITES GOYAZENSIS (Gardn.) Cabr. Brittonia 7: 54. 1950.

Senecio Goyazensis Gardn. Lond. Jour. Bot. 7:421. 1848.
Erechthites missionum Malme var. *lanceolata* Chod. & Hassl. Bull. Herb. Bois. II, 3:732. 1903.

Perennial, suffruticose, 1 to 1.5 m. tall, branching from near the base, branches erect. Stem glabrous, leafy, with internodes only approximately 1 cm. long. Leaves sometimes 20 cm. long and 2 cm. wide, but usually less, with sharply and minutely callose-serrate margins and acuminate apices; midrib inflated beneath; lateral veins numerous, fine, prominent, diverging from midrib at an angle of 30° or less, glabrous; lower leaves narrowly oblanceolate or rarely obovate, subpetiolate, upper leaves lanceolate to linear-lanceolate with semi-amplexicaul bases. Inflorescence of several to many capitula in a paniculate corymb from terminal and axillary branches; capitula at anthesis solitary on elongated peduncles 2 to 3 cm. long, which bear

[27] Brittonia 7:54. 1950.

several linear-subulate bracteoles, calyculate with short linear bracteoles; phyllaries of the involucre 12 to 14, glabrous, linear, 9 (to 13) mm. long, acute. Florets rather variable, with corollas coarsely filiform to infundibuliform; the outermost one or two florets in each spiral series pistillate or with more or less well-developed staminodia, their style-arm apices rounded to shortly appendaged; inner florets all hermaphroditic with corolla campanulate, deeply 5-lobed; the lobes linear-lanceolate, 1.0 to 1.25 (to 1.5) mm. long, 0.25 mm. wide, conspicuously papillose-thickened apically; style-arm apices appendaged above a fringe of divergent papillose hairs. Achene 2.5 to 3 mm. long, strongly ribbed, glabrate. Pappus white, slightly exceeding the phyllaries and subequaling the florets.

Upper Paraná River Valley in Brazil, with an outlier in northeastern Paraguay; co-extensive with *E. ignobilis* Bak.

BRAZIL. GOIAS: near Natividade, in shady woods, Dec. 1839 (or bushy places near Ville Natividade, Jan. 1840), *Gardner 3300* (BM, holotype; K, 2; F *ex* G, fragment; F *ex* P; F, photograph *ex* B). MINAS GERAIS: Lagoa Santa, *Warming 102* (S); Caldas, Feb. 1865, *Regnell III 795* (S, 4); 1844, *Weddell 1603* (P *ex* Hb. Sch. Bip., det. as *S. ignobilis*). SÃO PAULO: "in paludosis ad Mugi", Nov. 1833, *Lund 844* (G. Prodr., det. as *E. hieracifolia*). WITHOUT SPECIFIC DATA: *Pohl 633* (K, 2); *Pohl 2056* (W). PARAGUAY: Bellavista (Apa), *Hassler 8362* (S); Flum. Apa, Jan. 1902, *Hassler 8362* (G Deless., 3, presumptive types of *E. missionum* var. *lanceolata*, but redetermined by Chodat as a var. of *E. ignobilis*; BM; K, 2; W). Specimen excluded: Brazil, *Glaziou 16174* (BM, K; det. as *S. Goyazensis* but is homogamous, is *S. Grisebachii* Bak. var. *leptotus* Cabr.).

Cabrera gave the following reason for transferring *Senecio Goyazensis* Gardn. to *Erechtites*: "The marginal florets of this species are tubulous without anthers. The involucre is also typical of *Erechthites*." He did not cite specimens, nor is it clear that he examined the type. The sheets at Kew and the British Museum (Natural History) had not been loaned, but *Gardner 3300* appears to have been a very widely distributed number, and he probably saw an isotype.

Dissection of representative capitula on the type and on other specimens reveals that the trend toward unisexuality of the outer florets is only partially and quite variably developed. Some capitula have all the series-terminating florets with rudimentary stamens or an occasional floret with one or two stamens polliniferous. Other capitula show complete abortion of anthers in the terminating florets, with some reduction in the next one or two florets inward in each spiral. Furthermore, the terminal appendage of the style arm is variable. Occasionally it is merely short-conic with only a few very short papillae at its tip, but with a corona of low pollen-presenting papillae below, while sometimes the apical papillae are more elongated and fused, with a much closer approach to the tuft of fused hairs which characterizes *E. hieracifolia*. Never have I observed a truncated or merely low-domed apex such as is common in *Senecio* and is seen in *S. leptanthus* Phil., which has been also (I believe, wrongly) reduced to *Erechtites* by Cabrera.

I retain Gardner's species in *Erechtites* where Cabrera has placed it because of this conic and sometimes appendaged style-arm apex, and because of the size of the capitulum and the number of florets. In these latter features it is much closer to *E. hieracifolia* and *E. missionum* than it is, for example, to the erechthitoid species

of *Senecio* in Australia, which are characterized by usually much smaller heads and by quite abruptly truncated style arms. Finally, the large and strongly ribbed glabrate achene indicates closer affinity with *Erechtites* than with *Senecio*, it being in fact scarcely distinguishable from that of *E. hieracifolia*.

The type of *E. missionum* var. *lanceolata*, *Hassler 8326*, has leaves rather narrower than those of *Gardner 3300*, but is identical with it in floral features, including the very deep lobing of the corolla. The difference in leaf width is bridged by *Pohl 633*, which is intermediate between these two. The several specimens of *Gardner 3300* are not all alike, the holotype (BM) having leaves both shorter and wider than on the other sheets, whence the measurements in Gardner's description. *Pohl 2056* (W) is another broad-leaved specimen which is otherwise in good agreement.

Both *Gardner 3300* and *Hassler 8362* have corolla lobes linear-lanceolate, 1.25 mm. long, 0.25 mm. wide, with the apices glandulose-thickened; whereas *Malme 744* (holotype of *E. missionum* Malme) has corolla lobes deltoid, 0.5 mm. long and 0.33 mm. wide, with apices only slightly thickened. *Malme 744* has leaves petiolate, broadly lanceolate to ovate, and is irregularly toothed or subincised; whereas both *Gardner 3300* and *Hassler 8362* have leaves sessile, narrowly lanceolate, and regularly serrate. I am certain that the proper affiliation of Hassler's specimen is with *E. goyazensis* rather than with *E. missionum*, as Chodat at first supposed. The sheets in the Delessert Herbarium reveal that Chodat later determined *Hassler 8362* as a small-headed form of *E. ignobilis*, but neither Chodat nor Schultz Bipontinus ever published this name. Actually, there is good reason to suppose that the name *Senecio ignobilis* may have originally been given by Schultz Bipontinus to a specimen of this taxon of Gardner's rather than to the large-headed taxon to which Baker later applied it, judging by specimens in his herbarium (see below, under *E. ignobilis*).

The affinites of *E. goyazensis* are much closer to *E. ignobilis* than to any of the other species of *Erechtites*, but the two species differ not only in the sizes of the several parts of the capitulum but also in corolla lobing and in leaf margin and venation. Were it not for these features, *E. ignobilis* might be simply a polyploid of *E. goyazensis*, and these differences do not exclude the possibility. The relationship of these two co-extensive perennial species might well be the subject of a cytogenetic study.

5. ERECHTITES IGNOBILIS Baker, in Mart. Fl. Bras. 6^3: 299. 1884.

Senecio ignobilis Sch. Bip. *in sched. ex* Baker, *l. c., in syn. nom. nud.*

Perennial from a woody base; shoots subherbaceous, glabrous, 40 to 80 cm. high (or more?), sparsely branched in the inflorescence only. Leaves rather crowded toward the base, margins remotely and sharply dentate, apices acute; lowest leaves obovate to oblanceolate, subpetiolate, 7 to 10 cm. long, 12 to 18 mm. wide, upper leaves lanceolate to linear-lanceolate, sessile, smaller. Inflorescence corymbose, consisting of a few capitula borne singly on long peduncles which terminate the stem and the few axillary branches; capitula 18 to 25 mm. long,

9 to 12 mm. wide when pressed. Involucre oblong, of about 15 linear, glabrous phyllaries 16 to 20 mm. long, with 4- or 5-nerved keel and scarious margins, exceeded by both pappus and florets at full maturity; outermost one or two florets of each spiral-series filiform, functionally pistillate but frequently containing rudimentary stamens; remainder of florets hermaphroditic; style-arm apices shortly appendaged; corollas 16 to 18 mm. long. Achene 4 mm. long, subcylindric, strongly ribbed, glabrate, dark brown; pappus abundant, white, exceeding phyllaries, subequalling florets.

Easily distinguished from *E. goyazensis* by the much larger and fewer capitula.

Lectotype: "Brasilia, ex herb. hort. Petropolitani, rec'd. 11/66, *Senecio ignobilis* Sch. Bip. (*teste* Sch. Bip.)", *Riedel* (K!).

Apparently confined to the Paraná River Valley.

BRAZIL. "Brasilia, etc.", *Riedel* (BM); "379 ex hb. hort. Petrop., S. *ignobilis* Sch. Bip. (teste Sch. Bip.), Brasilia", *Riedel* (W); "512 . . . in paludosis Yttu, Febr. 1836", *Riedel* (P, *ex* Hb. Sch. Bip., not det. as *S. ignobilis!*). MINAS GERAIS: Lagoa Santa, *Warming* (K, F; photograph as *no. 106 ex* Hb. Haun., F); Lagoa Santa, *Lund* (S). SÃO PAULO: Canna [?] verde, Feb. 1849, *Regnell III 796* (S). PARANÁ: Turma, Jan. 1910, *Dusén 9061* (S); Jaguariahyva, April 1910, *Dusén 9698* (S, 22 cm. high, only 2 capitula), *Dusén 9727* (S), Oct. 1910 *Dusén 10528* (S), Dec. 1910, *Dusén 11006*, Nov. 1914, *Dusén 15994* (S), *Dusén 15998* (F, S). PARAGUAY: Caaguazú, *Hassler 9255* (K, S, W); in regione fluminis Corrientes, *Hassler 5864* (K, G Deless., S).

Baker described this species as an annual herb, but several specimens, including *Riedel 379* (W), *Hassler 9255* (K, W), and indeed two of the sheets at Kew determined by Baker, including the lectotype, have stems with distinctly woody bases and portions of perennial rootstocks attached.

Five collections are cited by Baker in the original description. Since no one specimen is designated as the nomenclatural type, all must be considered as syntypes. The name-bringing specimen being Riedel's, I have designated it as the lectotype.

The inclusion of *Senecio ignobilis* in synonymy by Baker does not constitute valid publication, and its association with Riedel's specimen appears to be the result of a curatorial error, probably at the St. Petersburg herbarium, which Baker, unsuspectingly perpetuated. The specimens in Schultz's herbarium which bear this epithet all belong to other taxa.

ERECHTHITOID SPECIES OF SENECIO IN AUSTRALASIA

SENECIO L. Gen. Pl., ed. 5, 375. 1754, *et auct., in sensu extenso.*

Trees, shrubs, or herbs; the erechthitoid species mostly semi-woody perennials. Capitula with all florets perfect and infundibuliform, or with the marginal florets more slender, pistillate, and either ligulate, subligulate, or irregularly or regularly 2- to 5-fid and sometimes with rudimentary stamens that very rarely may be polliniferous; style-arm apices truncated or low-domed, with crown of divergent papillose hairs at least in the perfect florets, and not prolonged into an appendage of fused papillose hairs.

The erechthitoid species are distinguished from true *Erechtites* by the style-arm apices truncated or low-domed rather than prolonged in an appendage of fused papillose hairs, as well as by smaller and less heavily ribbed achenes and usually smaller capitula. Represented by numerous species in Australasia, with outlying species in New Guinea and one in Java; occasionally met with elsewhere, as *S. leptanthus* Phil. in Chile and forms of *S. flavus* Sch. Bip. (*S. Decaisnei* DC.) from Arabia. Two Australasian species, *S. minimus* and *S. glomeratus*, are adventive on the Pacific Coast of the United States.

De Candolle divided the Australasian species of *Erechtites* into three sections, MICRODERIS, TULODISCUS, and PLAGIOTOME. Subsequent authors have only rarely attempted to classify their new taxa as to section. This probably reflects the fact that the separations made by de Candolle are highly artificial and do not stand examination. In returning these species to *Senecio* I have not retained these sections. Neither is it advisable to create a new section in *Senecio* for these erechthitoid species. Although they can, for the most part, readily be separated from the other Australasian species of *Senecio*, there are within the group some species which clearly intergrade into the discoid group and others which intergrade into the radiate group. Therefore, pending a badly needed revision of Australasian species of *Senecio* proper, I shall refer to the heterogamous material only as erechthitoid *Senecio*.

Our understanding of the relationships between the non-erechthitoid species of *Senecio* in Australasia is poorly developed, since it has not passed beyond the crude separation into discoid versus radiate species. The soundness of this separation has been questioned by virtually every competent syntherologist from the time of Linnaeus to the present. For example, Bory de St. Vincent[28], in criticizing Thunberg's confused efforts to restore *Jacobaea* Tourn., claimed that Linnaeus joined (discoid) *Senecio* and (radiate) *Jacobaea* as *Senecio* on the premise that the presence or absence of ligulate florets is not a constant character even in the same individuals of a single species. In support of this, Bory cited his own experience of finding that the late autumnal flowers of several radiate species, notably *Senecio Doria* L. (*Jacobaea pratensis, altissima, Limonii folio* Tourn.) lacked the ligulate florets ordinarily so conspicuous in earlier flowerings, and so could have been classified into a different genus from the one to which they would have been referred some months earlier, if the radiate and the discoid species were separated as Thunberg proposed.

A related situation is the existence of radiate varieties of discoid species, such as the not uncommon var. *radiatus* of *S. vulgaris*, the standard species of the genus, or the ligulate var. *fallax* (Greenm.) Fern. of *S. pauciflorus* Pursh. This latter species was regarded by W. J. Hooker[29] as a "rayless state of *S. aureus*".

Examination of a large number of specimens of *S. glomeratus* (*E. arguta* DC.) has revealed that in this species in particular the boundary between radiate and non-radiate conditions is very imperfect. A single specimen often possesses some pistil-

[28] Ann. Gén. Sci. Phys. 1:304-305. 1819.
[29] Flora Boreali-Americana 1:332-333. 1834.

late marginal florets so obliquely one-toothed as to be actually briefly ligulate, some that are irregularly bidentate, others that are irregularly 3-fid with one sinus twice or thrice as deep as the others, and still others that are perfectly regularly 3-fid with shallow sinuses. The same situation has been observed, but much less frequently, in other erechthitoid species.

In the folder of *Senecio aureus* var. *subnudus* at Kew there is a specimen (Great Slave Lake, *Gates & Mellenby*) which indicates that the outermost whorl of florets, those terminating each phyllotaxic spiral in the capitulum, is unstable in another direction. This is a discoid specimen which has rare marginal florets with stamens non-polliniferous, although the style-arm apex is clearly truncated. This is a close approach to the condition in *Erechtites*, especially in section *Goyazenses*, where an occasional marginal floret may bear a set of rudimentary stamens. It is a situation found over and over again in the erechthitoid species of Australasia, and is the basis for the statement made above concerning the intergrading of the discoid and the erechthitoid groups.

Another instance of an erechthitoid *Senecio* is the Chilean S. *leptanthus* Phil., recently transferred by Cabrera[30] to *Erechtites* because of its rather coarsely filiform pistillate marginal florets. This has a velutinous, weakly ribbed achene and low-domed, non-appendaged style-arm apex and is much better left in *Senecio*. The significant fact is that erechthitoid states of *Senecio* are not confined to Australasia, but are also found elsewhere. This adds weight to the point made by Mueller, that, as conceded by Bentham and Hooker in the 'Genera Plantarum', the genus *Senecio* could have slender pistillate florets. The limits of *Senecio* are not being unduly expanded or strained by the inclusion of heterogamous non-ligulate material from Australasia.

KEY TO ERECHTHITOID SPECIES OF *SENECIO*

A. Phyllaries 5 to 9, rarely 10 or 11 in some but not all capitula ..... B
B. Marginal florets pistillate, subligulate, disc florets androgynomorphic but with ovaries abortive and style arms rounded and densely hairy on outer face....see *Arrhenechthites*
BB. Marginal florets pistillate or occasionally with incomplete set of stamens, 3- to 5-dentate, disc florets fertile, style arms truncate, not densely hairy on outer face but with crown of divergent hairs C
C. Leaves distinctly once or twice pinnatisect ..... 1. *S. bipinnatisectus*
CC. Leaves not divided, merely toothed or incised ..... D
D. Achenes with short subappressed hairs in grooves between broad low ribs; florets not or scarcely exceeding phyllaries in number ..... E
E. Leaves scarcely or not at all auriculate, coarsely and irregularly toothed, teeth varying in size and spacing and often denticulate; florets 5-fid, marginal florets devoid of rudimentary stamens, disc florets infundibuliform ..... 2. *S. biserratus*
EE. Cauline leaves auriculate, coarsely but regularly toothed, teeth almost uniform in size and spacing; all florets 4-fid, subfiliform, and perfect, but with number of stamens varying from 1 to 4 ..... 3 *S. kermadecensis*
DD. Achenes with fine white subappressed hairs on sharp narrow ribs, glabrous in the grooves; florets twice or more as numerous as the phyllaries ..... F

[30] Not. Mus. La Plata 14 (Bot. No. 69):76. 1949.

F. Leaves minutely and regularly toothed, 5 to 8 per cm., variably arachnoid beneath, glabrate with age, sparsely arachnoid or glabrate above, not lobed, oblong or oblong-lanceolate; stem glabrate or beset with minute unicellular hairs ..... 4a. *S. mimimus* var. *minimus*

FF. Leaves less regularly fine-toothed, with prominent hispid pubescence in addition to arachnoid hairs, more or less lobate, especially the lower ones, obovate to oblong; stem beset with hispid multicellular hairs ..... 4b. *S. mimimus* var. *picridioides*

AA. Phyllaries 11 to 13 or more, or rarely a minority of capitula with 11 or 10 ..... G

G. Phyllaries 16 or more ..... H

H. Achenes short, subcylindric; leaves lanceolate with margin variably and irregularly dentate or lobate, teeth or lobes obtuse, pubescence mixed, hispid and arachnoid; phyllaries glabrous on inner face..... 5. *S. squarrosus*

HH. Achenes long and attenuate; leaves linear-lanceolate, margin sharply denticulate with occasional larger coarse loboid teeth; pubescence arachnoid on stem, leaf, and inflorescence; phyllaries arachnoid on both inner and outer faces ..... 6. *S. pyrophilus*

GG. Phyllaries 11 to 15, usually 12 or 13 I

I. Leaves only about 3 times as long as wide; plants glabrous or nearly so ..... J

J. Achenes 1.5 to 2.0 mm. long, short-cylindric, densely and uniformly covered with very short appressed hairs, glabrate, plump, and indistinctly ribbed when mature; leaves up to 8 cm. long and 3.5 cm. wide, ovate-lanceolate or broadly oblanceolate, irregularly coarse-toothed, with sharply denticulate teeth, auriculate and semi-amplexicaul at base, entirely glabrous ..... 7. *S. laceratus*

JJ. Achenes 3 to 3.5 mm. long, slenderly subcylindric, not densely and uniformly pubescent; leaves oblong, subpetiolate and slenderly auriculate, sinuate-dentate with 3 to 5 teeth on either side, glabrous above, minutely short-haired on nerves beneath; lower leaves 4 to 5 cm. long and 1 to 1.5 cm. wide; plant of New Guinea ..... 8. *S. papuanus*

II. Leaves more than 3 times longer than wide; pubescence various ..... K

K. Leaves and stems glabrous or sparsely cottony-haired when young L

L. Leaves runcinately pinnatifid, the segments long, narrow, and retrorse, apical segments on upper leaves filiform-acuminate; phyllaries 1 cm. long; marginal florets about 40, disc florets about ⅓ as many; achenes 2.5 to 3 mm. long, subrostrate, with short, suberect papilliform hairs on the ribs..9. *S. runcinifolius*

LL. Leaves subentire to sinuate-lobate, with lobes broad, not retrorsely pinnatifid ..... M

M. Achenes 4 mm. long, faintly ribbed, glabrous or sparsely white-haired in the grooves; leaves oblong-linear to broadly oblong, obtuse, sinuate-dentate, sinuate-lobate, or pinnatifid; marginal florets 10 to 15, disc florets about twice as numerous; phyllaries 6 mm. long with short-acute apices ..... 10. *S. wairauensis*

MM. Achenes 3 mm. long, prominently ribbed, hairs suberect on or beside the ribs but not in the bottom of the grooves; phyllaries 5 to 5.5 mm. long with apices abruptly narrowed and then bluntly acuminate; radical leaves oblanceolate, long-attenuate to subpetiolate, 3.5 cm. long and 6 mm. wide; cauline leaves linear-lanceolate to linear-oblong, 6 cm. long, 5 mm. wide, remotely sinuate-dentate to subentire ..... 11. *S. dunedinensis*

(Glabrate states of *S. quadridentatus* may be sought here; may be recognized by leaves linear-lanceolate, with margins minutely denticulate and strongly revolute, and phyllaries slenderly acuminate.)

KK. Leaves and stems conspicuously pubescent, hairs arachnoid or hispid or both combined; sometimes nearly glabrate at maturity ..... N

N. Leaves entire or denticulate; achenes more or less fusiform, 2.5 mm. long or longer ..... O

O. Leaves linear to lanceolate, to as long as 9 cm., 0.3 cm. wide; phyllaries 6.5 to 8 mm. long, at first arachnoid then glabrate, except basally, 2-nerved on lower third only, apices acuminate .....12. *S. quadridentatus*

OO. Lower leaves oblanceolate or obovate-lanceolate, 8 to 12 cm. long, 1.5 to 1.8 cm. wide; phyllaries 6 mm. long, glabrous or sparsely arachnoid at base, 2-nerved, often purplish, apices acuminate .....13. *S. gunnii*

NN. Leaves toothed, incised, or irregularly lobed, achenes short-cylindric, 1.5 to 2.0 mm. long ..... P

P. Receptacle and base of involucre lanate; leaves densely arachnoid beneath, sparsely arachnoid to glabrate above ..... Q

Q. Achene with 10 low broad ridges; apex of phyllary acute with scarious margin .....14. *S. glomeratus*

QQ. Achene with 5 extremely narrow high thin ridges; apex of phyllary long and slenderly acuminate and essentially lacking scarious margin .....15. *S. laticostatus*

PP. Receptacle and involucre glabrous; phyllaries strongly 2-ridged; leaves with crisped multicellular hairs beneath and hispid or scabrid above, rarely glabrate; bidentately auriculate ..... R

R. Leaves callose-denticulate to coarsely dentate or somewhat lobate ..... S

S. Hairs on upper leaf surface with subtuberculate bases; achenes 1.5 to 1.75 mm. long..... .....16a. *S. hispidulus* var. *hispidulus*

SS. Hairs on upper leaf surface without subtuberculate bases; achenes 1.75 to 2 mm. long .....16b. *S. hispidulus* var. *scaberulus*

RR. Leaves once-pinnatisect, the segments denticulate. .....16c. *S. hispidulus* var. *dissectus*

PPP. Receptacle and involucre glabrous or densely lanate; leaf pubescence both arachnoid and hispid; achenes usually short, various introgradient hybrids .....*S. glomeratus* × *S. hispidulus*

1. SENECIO **bipinnatisectus** Belcher, nom. nov.

Erechtites Atkinsoniae F. Muell. Frag. Phytogr. Austr. 5: 88. 1865.
Senecio Atkinsoniae F. Muell. *ibid. ut* synonym, *nom. nud.; non Senecio Atkinsonii* C. B. Clarke, Comp. Ind. 207. 1876.

Stout plant with stem strongly striate, subglabrous or sparsely short-haired, branched above with branches ascending, densely leafy; basal portion not seen. Cauline leaves and bracts pinnatisect or bipinnatisect, with segments irregularly denticulate or subentire, slender, markedly revolute, sessile, with pinnatisect auricles; lower leaves up to 10 cm. long with segments up to 5 cm. long, size gradually reduced upward; older leaves glabrate, younger subarachnoid beneath with a few glandular or tuberculate-hispid hairs above. Inflorescences decompound, corymbose, varying in expansion from very simple corymbs with 3 or 4 capitula per branch to repeatedly rebranched clusters 25 cm. in diameter with scores of capitula, axes glabrous throughout or sparsely short-haired on peduncles; peduncles with

several simple, subulate, erect, sometimes ciliolate bracteoles. Capitula usually with 8 phyllaries, sometimes as many as 11 on some but not all capitula; phyllaries 6 to 6.5 mm. long, slender, usually 2-nerved and only moderately keeled, glabrous or minutely glandular-pubescent, apices shortly tapered, obtuse or very slightly acute. Florets slightly longer than the phyllaries and equaling pappus, marginal ones pistillate, filiform, 3- or 4-fid, twice or thrice as numerous as the hermaphroditic slenderly infundibuliform 5-fid disc florets. Achene 2 mm. long, short-subcylindric, not attenuate-rostrate, dark red, ribbed, glabrous or sparsely set with very short white hairs especially when immature.

Apparently confined to the Coastal Ranges of New South Wales and southeastern Queensland.[31]

AUSTRALIA. NEW SOUTH WALES: Blue Mountains, *Louise Atkinson* (K, det. by Mueller, syntype duplicate and lectotype); Monkey Creek towards Port Jackson, *Woolls* (MEL, syntype); Sydney, *Wilkes Exp.* (US); "Senecio, Australasia, N. S. W.", *Hugel* (W); Brushy Mountains near Gloucester, 1881, *Betche* (NSW); Port Macquarie, 1898, *Boorman* (NSW); Port Stacking, Feb. 1899, *Camfield* (NSW); Blackheath, April 1899, *Maiden* (NSW, W); Bulli Pass, 1900, *Hamilton* (NSW); Blackhurst, swamp, Jan. 1903, *Camfield* (NSW); Jervis Bay, 1926, *Rodway* (K, NSW); Beaumont, 1935, *Rodway 1687* (K); Braidwood, 1936, *Stenfield* (NSW). QUEENSLAND: Blackwall Range, April 1918, *White* (K); Candle Mountain, May 1918, *White* (NSW); Main Range, top of Mt. Mitchell, 3760 ft., *White 6872* (NY). WITHOUT LOCALITY: "Iter Australiense 1802 to 1805", *R. Brown 2279* (K); "Nova Hollandia, *Erechtites sonchoides* Cand.", *Ferd. Bauer* (W).

The new epithet refers to the characteristic deep division of the leaf and bract blades. As stated by Mueller, this species differs from all its erechthitoid congeners by the form of its leaves. But in *Senecio* it resembles *S. anethifolius* in its pinnatisect leaves with narrow divisions. Comparison of specimens of *S. bipinnatisectus* with the type of *S. anethifolius* (G!) shows them to be readily distinguishable even in the sterile state. The leaf segments of the former are strongly revolute, irregularly denticulate, minutely tuberculate-hispid above and subarachnoid beneath, whereas those of the latter are slightly revolute, non-denticulate, and glabrous. The floral features are, of course, much more distinct, the former having moderately keeled and minutely glandular-pubescent phyllaries 6 to 6.5 mm. long, and marginal florets pistillate, filiform, and scarcely exceeding the phyllaries; whereas the latter has glabrous phyllaries 5.0 to 5.5 mm. long, and marginal florets hermaphroditic, infundibuliform, and much exceeding the phyllaries. I do not know any other Australasian species with which either of these might be confused, unless it might be *S. hispidulus* var. *dissectus* (Benth.) Belcher. In this variety, however, the leaves are only once or very imperfectly twice dissected, the segments are sharply angulate-lobate rather than denticulate or entire, and the pubescence is coarsely tuberculate-hispid. The inflorescence is, of course, unmistakably distinct from both the above species.

[31] The description of this and each subsequent erechthitoid species is followed by a list of specimens examined, with the herbaria in which they are found indicated by the symbols proposed by Lanjouw. In the case of the more commonly collected species, the list is a selected one to show the range of distribution and variation. Of less common species, all material examined has been cited. In each case the typifying specimen, if seen, is listed first.

Mueller gave the number of phyllaries as "11 to 13". I have not found any capitulum with more than eleven, and the majority had only eight. The lectotype at Kew does have a few heads with up to eleven. A certain amount of instability in the number of phyllaries seems to be common in those genera of Compositae with essentially uniseriate involucres, and indeed seems rather widespread in the family. For individual plants, however, it is usually possible to find that the modal phyllary number of a majority of the capitula is very close to one of the peaks of the phyllotaxic series: 8, 13, 21, etc. Further, there is generally a correlation with other characters of taxonomic significance, so that the use of the modal number of phyllaries as an easily seen key character is valuable. Because this modal number for S. *bipinnatisectus* is 8, and seems not to reach the value of 13 assigned by Mueller, I have placed this species in the group with eight phyllaries.

The number of florets per capitulum is quite variable, and little dependence should be placed on the exact numbers given in descriptions, as by de Candolle. Richard, who appears to have studied these species more carefully, omitted almost all reference to specific numbers of florets. Approximate numbers, however, are helpful, and the ratio between pistillate and perfect florets may be significant. For this species a representative count is sixteen pistillate to five perfect florets in one capitulum, a ratio of about three to one.

Immature buds of this species closely resemble those of S. *minimus* in size, shape, number of phyllaries, and particularly in a spiraled appearance. This is caused by the unexpanded phyllaries running slantingly rather than lying straight from base to apex. The leaves also agree with those of S. *minimus* in having usually quite large auricles, and these two species are undoubtedly quite closely related.

2. SENECIO **biserratus** Belcher, nom. nov.

Senecio flaccidus A. Rich. Sert. Astrolabe, 110-112. 1834; *non* Less. Linnaea 5: 161. 1831.
Erechtites sonchoides DC. Prodr. 6: 296. 1838; *non Senecio sonchoides* Kunth, in HBK. Nov. Gen. & Sp. 4:178. 1820.
Erechthites prenanthoides Benth. Fl. Austral. 3: 658. 1866, *pro parte*, *non* DC.; Black, Fl. S. Austral. 4: 609-610, *pl.* 50. 1929, *non* DC.

Stem erect, to 5 feet tall, glabrous or glabrate, simple or sparingly branched above, leafy. Leaves rather crowded and suberect, membranous, as much as 11 cm. long and 4 cm. wide, gradually and proportionately reduced upward, sessile, the lower ones slightly or much attenuated and not clasping, the upper ones auriculate and semiamplexicaul, all oblong to oblong-lanceolate, serrate, with irregular larger teeth again finely toothed, glabrous or sparsely set with rather long multicellular hairs. Inflorescence a corymbose panicle, open and lax at maturity, the branches, peduncles, calyculi, and involucres essentially glabrous; bracteoles broad, subulate. Involucre of 7 or 8 phyllaries; phyllaries 5 to 6 mm. long, alternately narrower and broader, to 1 mm. wide, keel more or less conspicuously 2-ridged with a broad or narrow shallow groove between, apices alternately moderately long-acute and quite bluntly obtuse (i.e., probably actually 2-seriate), all minutely ciliolate, with a marked tendency to curl after achenes have been shed. Florets scarcely exceeding phyllaries in number. Marginal florets pistillate, filiform, 5-fid, lacking rudi-

mentary stamens; disc florets hermaphroditic, slenderly infundibuliform, 5-fid. Achene 2.5 to 2.75 mm. long, subcylindric, slightly tapered toward base, apex not attenuate-rostrate but slightly contracted below the apical callus, with white hairs in grooves between heavy low flattened ribs. Pappus and florets exceeding involucre by 1 to 2 mm.

AUSTRALIA. TASMANIA: "N. Holl. détr. d'Entrecasteaux", ex itin. *Baudin* (P. holotype); "Nouv^{e} Hollande cote merid^{e}, Mus. de Paris, 1821" (G Prodr., isotype?, holotype of *E. sonchoides* DC.); Deloraine, Jan. 1902, *Maiden* (NSW); Mount Field East, ca. 4000 ft., March 1906, *Maiden* (NSW); Eaglehawk Neck, Nov. 1924, *Lucas* (NSW); Hobart, near Myrtle Gully, Cascades, "in open forest burnt out previous summer, ca. 900 ft., stout upright herb 4½ ft. tall", March 1940, *Gordon* (HO, leaves as much as 11 cm. long, 4 cm. wide, coarsely lobed); Florentine Valley, Adamsfield track, 1500 ft., Feb. 1943, *Gordon* (HO); Gordon, Dec. 1952, *Curtis* (HO). VICTORIA: Port Fairy, *Whan* (NSW); Port Fairy, Nov. 1900, *Walker 7* (NSW). NEW SOUTH WALES: Port Jackson, *R. Brown 2277* (K). NEW ZEALAND. SOUTH ISLAND: Canterbury, Akaroa, *Raoul 30* (K); Otago, *Lyall* (K); Otago, Milford Sound, *Lyall* (K ex Hb. Hk. as *E. prenanthoides*, left-hand specimen only; right is *S. wairauensis*). STEWART ISLAND: "In arenosis maritimis", *Thouroude* (P). AUCKLAND ISLANDS: "*Erechtites arguta* var. *glaberrima*", *Wilkes Exped.* (K, US).

Bentham's reduction of this perfectly good species to *Erechtites prenanthoides* DC. (i.e., *S. minimus* Poir.) is unjustified, despite several points of similarity. By direct comparison of the types in the Prodromus Herbarium they may be separated rather easily by differences in achenes and leaf margins. The achene of *S. biserratus* is 2.5 to 2.75 mm. long, flat- and broad-ribbed, with hairs *between* the ribs; that of *S. minimus* ranges from 1.5 to 2.0 (to 2.25) mm. long, is sharply and narrowly ridged, and is hairy *on* the ridges rather than between them. The leaves of the former are coarsely and irregularly doubly serrate, as the new epithet indicates, whereas those of *S. minimus* are uniformly finely denticulate. Again, the former species is virtually glabrous except for the achene and sparse appressed hairs on both sides of the leaf, lacking the arachnoid pubescence on the lower surfaces of the leaves and on the juvenile parts which characterize the latter.

E. prenanthoides Black, by figure and description, is *S. biserratus*. The figure of the cross-section of the achene which shows hairs only in the narrow grooves is critically diagnostic, as is the irregularly toothed leaf. Black gives the distribution simply as "South-East". If this species actually is in southeastern South Australia, then it should also be more generally present in Victoria, to link up with its presence in New South Wales and Tasmania. The specimen from the Auckland Islands, incidentally, is the most southerly specimen of erechthitoid *Senecio* which I have seen.

De Candolle's diagnosis of *E. sonchoides*, based on a specimen at Geneva, was formed independently of Richard's, but agrees fairly well with it. He was uncertain of the identity, and queried Richard's name in the synonymy. He need not have been so cautious. His type and that of Richard are certainly conspecific, and are probably a part of the same gathering, by the expedition of Baudin. From de Candolle's account of the small number of phyllaries and florets, it seemed *E. sonchoides* might be an *Arrhenechthites*. Accordingly, the florets, and particularly the style arms of the central florets, on the type were carefully examined with the aid of detergent solution. The central florets are hermaphroditic, developing nor-

mal rather than abortive achenes; the style arms are long, recurved, and stigmatic; the style-arm apices are squarely truncated and not papillose on either apex or dorsum. It is a good *Senecio* despite the reduced number of parts.

3. SENECIO **kermadecensis** Belcher, sp. nov.

Perennis (?), caule herbaceo, solum versus apicem ramoso, dense foliaceo; foliis sessilibus late auriculatis, amplexicaulibus, vix constrictis super auriculas, ovato-lanceolatis, inaequaliter dentatis, acutis vel subobtusis, nonnihil scabris, subglabris, majoribus (infimis haud visis) 13 cm. longis, 4 cm. latis; inflorescentiis corymbosis; capitulis cylindricis, calyculatis; involucri squamis plerumque 6 (5 – 7), linearibus, glabris, 5 mm. longis; floribus paucis, numero squamis similibus, omnibus tenuiter filiformibus, apice vix dilatatis, 4-dentatis; staminibus 1-4 numero variante in floribus capituli singuli, omnibus polliniferis, ramis styli truncatis, papillis marginalibus divergentibus praeditis; achaeniis subcylindricis, 2 mm. longis, 10-costatis, subappresse puberulis inter costas; pappo niveo, subsetaceo, pluriseriato.

Specimen typicum legit W. R. B. Oliver in insula prope Novam Zeelandicam "Sunday Island" dicta in Archipelagine Kermadecensi. Endemica species. Specimen in herbario Kewensi.

Cheeseman, in 1925, confused this species with *E. prenanthoides* DC., and attributed to W. R. B. Oliver the statement that it was "not uncommon on Sunday Island" of the Kermadec Islands. Oliver's specimen at Kew, the holotype, bears that statement on its label. Erroneously determined as *E. prenanthoides* DC., this specimen superficially resembles that species, but is actually distinct and apparently undescribed.

It is remarkable in the genus for its unusual capitulum, with phyllaries 5 to 7, usually six, and the florets about equal in number. All florets appear to have styles and functional stamens, the number of stamens varying within the same capitulum from 4 to 1. The florets are nearly filiform, very little dilated apically, and 4-fid; the style-arm apices are truncate with a fringe of diverging papillae. Some achenes in the capitula examined were less developed than others in the same capitulum, suggesting partial sterility, but this appeared not to correlate with the position of the achene in the capitulum nor with the number of stamens. The achenes, although similar in size to those of S. *minimus*, resemble those of S. *biserratus* in being hairy *between* the ridges. The leaves, though resembling those of S. *minimus* in general shape, were much more broad and coarse than is typical for that species.

Senecio kermadecensis must be regarded as a discoid *Senecio* of unusual interest, suggesting a transition between the discoid and the erechthitoid kinds, as shown by the partial sterilization and the slenderness of the florets. It also suggests a transition between *Senecio* and *Arrhenechthites*, as shown by reduction in floret number and possible tendency to abortion of some ovaries. Its closest affinity in the erechthitoid group is not with S. *minimus*, as Oliver and Cheeseman thought, but with S. *biserratus*, as shown by the drastic reduction in floret number and by the achenial pubescence. I hesitated to describe it without examining more material. But since it raises the interesting possibility that other peculiar endemics may be masquerading as well-known species, it seemed desirable to call attention to it.

4. SENECIO MINIMUS Poir. in Lam. Ency. Méth. Bot. Suppl. 5: 130. 1817.

Inflorescence a corymbose panicle, usually large with very many capitula, diffusely much branched, branches suberect or lax; arachnoid in bud, glabrate when expanded; bracts subtending the branches rapidly and progressively reduced in size upward, two or three bracteoles on each ultimate peduncle, capitulum with calyculus of 5 or 6 short slender inconspicuous bracteoles. Involucre of 8 phyllaries, rarely one or two more or less; phyllaries 6 to 7 mm. long, linear, alternately 2-nerved and broader with broadly obtuse apex, and 1-nerved and narrower with narrowly obtuse apex, glabrous or subglabrous but with apices ciliolate and slightly darkened or not. Florets exceeding involucre, slightly exceeded by pappus; marginal florets filiform, briefly 3-, 4-fid, somewhat more numerous (ca. 12 versus 7) than the disc florets, which are hermaphroditic, slender, slightly expanded into a narrowly infundibuliform 5-fid limb. Achene 1.75 to 2.0 (to 2.25) mm. long, short-cylindric, dark reddish-brown or brown, with fine white subappressed hairs on the narrow ribs, the grooves glabrous, non-attenuate but with apex callose-annulate. Pappus white, filiform.

4a. SENECIO MINIMUS var. **minimus**

Erechtites minima (Poir.) DC. Prodr. 6: 437. 1838, in synonymy.
Erechtites pumila DC. Prodr. 6: 297. 1838, said by DC. to be based on "S. *pumilus* Poir.", which is non existent; *non* Armstrong, Trans. N. Z. Inst. 13: 338. 1887.
Erechtites prenanthoides DC. Prodr. 6:296. 1838; *non* A. Rich. (as *Senecio*, based on *Gaudichaud 4*, P!, which is S. *quadridentatus*); *non* Greenm. & Hieron. Engl. Bot. Jahrb. 29:63. 1900, which is *E. valerianaefolia* f. *prenanthoides*.
Senecio hieracifolius Hb. Labill. *ex* DC. Prodr. 6:296. 1838, *ut syn.*; *non* Linn. Sp. Pl.
Erechtites prenanthoides Hook. f. Fl. N. Z. 141. 1853, *pro parte*, excl. var. *minor* Hook. f.
Senecio Mülleri Regel, Ind. Sem. Hort. Bot. Imp. Petrop. 31. 1863; *non* Kirk, Trans. N. Z. Inst. 15: 359. 1883; *non Erechtites Muelleri* Lange, Ind. Sem. Hort. Haun. 28. 1861 [not seen]; Bot. Tidskr. II. 4: 5. *t.* 3. 1874.
Senecio Warscewiczii Hort. Berol. *apud* Vatke, App. Ind. Sem. Hort. Bot. Berol. 21. 1875; *non* A. Br. & Bouché, Ind. Sem. Hort. Bot. Berol. App. 13. 1851; Linnaea 25: 298. 1852 (from Guatemala).
Senecio heterophylla [sic !] Colenso, Trans. N. Z. Inst. 27: 389. 1894.
Erechtites Labillardieri Hieron. Engl. Bot. Jahrb. 29: 63. 1900, superfluous.

Herbaceous plant of somewhat glabrate aspect, robust specimens exceeding 1 m. in height, others as low as 15 cm. Stem erect, sulcate, simple or sparingly branched below the inflorescence or with numerous short axillary branches with much-reduced leaves, glabrous or sparsely set with minute white hairs. Leaves rather variable in size and shape, lower cauline ones on robust specimens reaching or somewhat exceeding a length of 10 cm., 1.5 cm. wide, size rather rapidly reduced upward on stem, width decreasing proportionately more rapidly than length; lower leaves broadly lanceolate, upper linear-lanceolate; lower portion of blade not or only slightly constricted, rarely subpetiolate, the base slightly to conspicuously expanded into clasping lobes or auricles; the reduced leaves of axillary branches sometimes appearing non-auriculate, subpetiolate, oblanceolate; margins evenly denticulate, with 5 to 8 teeth per cm., or slightly irregularly denticulate with some teeth a little coarser but never pinnatifid; youngest leaves densely arachnoid below, sparsely so above, older leaves glabrate.

Generally distributed in temperate Australia, Tasmania, and New Zealand; adventive weed in California and Oregon.

AUSTRALIA. TASMANIA: "Capite Van Dieman", *Labillardière* (FI, "*Senecio hieracifolius* Lin., Billardière, N. Holl.", with specific epithet deleted and "minima" written beneath in Poiret's script, holotype; P, "*Senecio minima* Enc. Sup., Labill. Nov. Holl.", fragment of holotype, ex Hb. Poir.; BM; K; G Deles.; G Prodr., "*Senecio hyeracifolius* e nova hollandia, m. Labillardière 1808", holotype of *E. prenanthoides* DC.); *Gunn 1175*, Georgetown (K, 2), Marlborough (K), St. Patrick's (K, NSW); *Maiden*, Recherche Bay 1908, Swanport to Swansea 1902, Port Arthur 1906, Mount Field East 1906 (all NSW); Russell Falls, March 1910, *Cheel* (NSW); Lilydale, Jan. 1943, *Wardrop* (HO). VICTORIA: Wendu Vale, *Robertson 469* (K, NSW); Dandenong Range, *Mueller* (K); Blacks Spur, Jan. 1900, *Deane* (NSW); Bonang, Jan. 1910, *Forsyth*, (NSW). NEW SOUTH WALES: New Castle Bay, *R. Brown 2276* (K); Sydney & Newcastle, May-June 1855, *Harvey* (K); New England, *Mueller* (K); Box Point to Kangaroo Island, Oct. 1898, *Maiden* (NSW, W); Mt. Kembla, Nov. 1899, *Fletcher* (NSW); Blackhurst, Jan. 1903, *Camfield* (US, in 2 non-contiguous pieces, the sterile one with leaves to 16 cm. long and 4 cm. wide but otherwise congruent).

NEW ZEALAND: "New Zealand 1769-70", *Banks & Solander* (US); Nelson, Graham River, *Cheeseman* (US); Wairau Valley, *Travers 16* (K); *Colenso* (K, isotypes (?) of *S. heterophylla*); *Hooker* (W ex Hb. Sch. Bip.); Westland, Parvu, Jan. 1937, *Lothian* (K).

UNITED STATES. CALIFORNIA: Campeche, 6 July 1931, *Jones 59096* (BM); Humboldt Co., Trinidad, Sept. 1931, *Parks 01058* (BM, F, MICH, NSW); Marin Co., Almonte, edge of salt marsh, July 1944, *Howell 19857* (F, S). OREGON: Lane Co., Aug. 1949, *Cronquist 6107* (S).

CULTIVATED: "809 *Senecio Warscewiczii*" 62 Hort. Berol. (P ex Hb. Sch. Bip.); "*Senecio Muelleri*", Hort. Bot. Petrop., 1863 (K, isotype (?) of *S. Mülleri* Regel).

I designate the piece of *S. minimus* at Paris as a fragment of the holotype, rather than an isotype, because the jagged base exactly matches the stump of a branch on the holotype. Poiret evidently obtained this small branch for himself when he described the species. All the other sheets of Labillardière's "Senecio hyeracifolius" which I cited are authentic isotypes, with the sole exception of the ligulate fragment on the sheet at Florence from Labillardière's own herbarium, and there are probably still other sheets in other herbaria.

The isotype of *S. Müllerii* Regel was compared with the holotype fragment of *S. minimus* and found conspecific. It was unquestionably distinct from presumably authentic specimens of *E. Muelleri* Lange which were raised at Vienna from seed from Copenhagen and which appear to be a form in the hybrid swarm, *S. hispidulus* × *S. quadridentatus*. Vatke's assumption of identity between Regel's species and Lange's, made in a note clarifying the status of *S. Warscewiczii* Hort. Berol., was an error.

This is one of the most distinctive of the erechthitoid species of *Senecio*, and shows little affinity with the other species. Its closest resemblance is to *S. biserratus*, as discussed above, although the two are readily separable. Cheeseman's statement that this species is "not uncommon on Sunday Island" of the Kermadecs appears to be based on Oliver's specimen, the holotype of *S. kermadecensis*. *S. minimus* is not to be included in the flora of the Kermadec Islands on this evidence.

4b. SENECIO MINIMUS var. **picridioides** (Turcz.) Belcher, comb. nov.

Erechtites picridioides Turcz. Bull. Soc. Imp. Nat. Mosc. 24: 200. 1851; Black, Fl. S. Austral. 4: 610. 1929; *non* Sond. & Muell. Linnaea 25: 253. 1852, which is S. *runcinifolius* Willis.

Erechthites prenanthoides DC. var. *picridioides* (Turcz.) Benth. Fl. Austral. 3: 658. 1866.

Differing from var. *minimus* in having the stem more robust and coarse and beset with hispid multicellular hairs; the leaves larger, lobate, and hispid, with acute callose teeth; and the corollas somewhat variable in number of lobes.

WESTERN AUSTRALIA: Swan River, 1845, *Drummond 132* (K, 2; FI; all isotypes).

I have not seen the holotype of this taxon, but the isotypes which I saw agreed well with the description. Dissection of florets, however, revealed much variation in lobing of the corollas. Pistillate florets were 2-fid, 3-fid, or 4-fid; the perfect florets were 3-, 4-, or 5-fid. I have not observed such variability in var. *minimus*. From hispid pubescence and callose-dentate leaves, as well as this variation in lobing, I suspect possible hybridization with S. *hispidulus*. But because of the great similarity in the other floral and the fruit characters between these specimens and the holotype of var. *minimus* I have maintained the varietal status given them by Bentham, pending further study.

Turczaninow stated: "*Species Er. senecioidi et argutae affinis.*" I find no other reference to the former, and it is presumably a *nomen nudum*. The Kew sheets of *Drummond 132* have tickets reading: "Erechtites / E. sonchoidi DC. Prodr. / Sw. riv. Drummond". "E. sonchoidi" is written hastily, and likely was miscopied by Turczaninow.

Black maintained this taxon as a species, separate from his *E. prenanthoides*. This was fully justified, since the latter is actually S. *biserratus!* He gave for *E. picridioides* a wide distribution in South Australia; namely, Encounter Bay, Kangaroo Island, Murray Lands, Yorke and Eyre Peninsulas, South-East. I have seen none of these specimens.

5. SENECIO SQUARROSUS A. Rich. Sert. Astrolabe, 107, *tab. 35*. 1834.

Erechtites Richardiana DC. Prodr. 6: 297. 1838.

Erechthites hispidula Benth. Fl. Austral. 3: 660. 1866, *pro parte*; *non* (A. Rich.) DC. Prodr. 6: 296. 1838; *non* Black, Fl. S. Austral. 4: 610. 1929.

Stem erect, simple, leafy, sparsely arachnoid. Leaves lanceolate-linear, 7 to 10 cm. long, 0.8 to 1.0 cm. wide, acute, minutely to coarsely remotely toothed to sublobulate, glabrous or sparsely arachnoid beneath and somewhat scabrid above; lower subpetiolate, upper sessile with more or less coarsely toothed auricles. Inflorescence a terminal cyme of relatively few capitula, sparsely arachnoid on peduncles and bracteoles. Capitula about 10 mm. long, 9 mm. wide, calyculate, bracteoles of the calyculus linear, arachnoid. Involucre of 16 to 20 linear phyllaries 7 to 8.5 mm. long with arachnoid bases, hyaline margins and recurved apices. Marginal florets pistillate, corolla filiform, 7 mm. long, 5-fid, lobes long-acute, 0.4 to 0.5 mm. long, 0.1 mm. wide, apices glandular, sinuses not all always of same depth. Disc florets hermaphroditic, corolla slightly infundibuliform, 5-fid, lobes similar to those of the marginal florets but slightly broader, style arms exserted. Achene 2 mm. long, blackish, thick-cylindric, rather thickly set with short white or tawny hairs.

Pappus white, slightly exceeding phyllaries and florets.

AUSTRALIA. NEW SOUTH WALES: Port Jackson, *Gaudichaud 5* (P, holotype; frag. G Prodr.). VICTORIA: Wendu River, in forest, Sept. 1842, *Robertson 289* (K); Wendu Vale, Sept. 1843, *Robertson 690* (K, on same sheet with *289* and another large-headed Robertson specimen, the latter indet.); in meadow between Melbourne and Darbent's Creek, Oct. 1852, *Mueller* (K *ex* Hb. Hk., immature but appears to be this species); ? Cataract Hills, Oct. 1863, *Mueller* (NSW). TASMANIA: Formosa, 4 Nov. 1844, *Gunn 508* (K, on same sheet with one specimen of Launceston, *Gunn 508*, which is indet. but definitely not this species); Launceston, 11 Nov. 1844, *Gunn 508* (K, a separate sheet from the preceding); Van Dieman's Land, *Gunn 508* (W, rather more pubescent than the Kew sheets); Hobart, Nov. 1923, *Lucas* (NSW); Blackman's Bay near Kingston, Nov. 1935, *Rodway 2039* (K).

The identity of S. *squarrosus* was completely lost, due to Bentham's inclusion of it in his *E. hispidula*. Yet it is easily one of the most distinctive of the erechthitoid species, readily recognized by its large capitulum, numerous phyllaries, short blackish achene, and coarsely toothed leaves. The holotype agrees well with Richard's plate and description, including the serration of the leaves. The abscission line (?) depicted at the base of each leaf is misleading, however. No such feature can now be seen on the type, and it is likely only an artist's device for marking the leaf base. One of the distinctive features, the number of phyllaries, is not described by Richard, but can be recognized in the drawing of the capitulum.

Erechtites hispidula Benth. is a mixture of at least two separate elements, as shown both by the description and by the specimens at Kew determined by Bentham. Bentham mistook certain specimens of Gunn's distribution number, *508*, to be true *E. hispidula*, and to these added other specimens with large capitula which superficially resembled them but which have long attenuate-rostrate achenes, hence his statement, "Achenes slender and striate as in *E. quadridentata* or rather shorter." A comparison of the Launceston specimen of *Gunn 508*, which Bentham determined as *E. hispidula*, with the types of S. *hispidulus* and S. *squarrosus* showed that is was identical with the latter, not the former, and has the short achene as shown in the figure of S. *squarrosus*.

The large-headed specimens with long, attenuate-rostrate achenes are also characterized by somewhat fewer phyllaries, nearly linear subentire leaves, and cottony pubescence with sometimes a few hispid hairs added. It is to this group, rather than to S. *squarrosus*, that *Erechtites hispidula* Black applies, judging from his description of it as "near the preceding, *E. quadridentata*", and "achenes as in *E. quadridentata*". Certainly S. *hispidulus* is excluded by his description, particularly by the dimensions given for the capitulum. The status of this group is still unsettled, but a plausible suggestion is that it may represent a polyploid state of S. *quadridentatus*. It has not yet been given a name of its own by any one, and I have refrained from doing so until its status can be clarified.

6. SENECIO PYROPHILUS Zoll. & Mor. *ex* Zoll. Nat. - en Geneeskundig Arch. v. Neërland's - Indië 2: 266. 1845; Syst. Verzeichn. 125. 1854.

Erechtites pyrophila Sch. Bip. *ex* Miq. Fl. Ind. Bat. 2: 97. 1856; Koorders, Nat. Tijds. Neder. Indië 60: 250. 1900; Exkursionsfl. von Java 3: 342. 1912 (as *E. pyrophila* (Zoll.) Sch. Bip.).

Erechtbites quadridentata O. Kuntze, Rev. Gen. Pl. 1: 325. 1891; *non* DC.

Perennial, with several to many spreading, then ascending, subherbaceous shoots from a short woody base. Stems sulcate, arachnoid to lanate especially on younger portions, with erect branches, leaves crowded on the basal portion and more distant above. Lower leaves 6 to 9 cm. long, 4 to 6 mm. wide, linear-oblanceolate, long-attenuate, not auriculate, sharply callose-denticulate with occasionally a few larger coarse lobate teeth, subglabrous to arachnoid above, arachnoid to lanate beneath; upper leaves only slightly shorter, not attenuate, linear-lanceolate, briefly and narrowly auriculate just above the attachment. Inflorescences corymbose, at first compact, then rather lax, with peduncles elongate and distant at maturity; lanate when young, later glabrate; bracteoles few, scattered, linear-subulate. Capitula few, with calyculus and receptacle arachnoid. Phyllaries 16 to 18, long-linear, 7 to 8 mm. long, 0.75 to 1 mm. wide; keel broad, flat, scurfy-arachnoid on entire length, obscurely 2-nerved with nerves narrow and only slightly darkened, scarious margins quite narrow, apices long-acuminate, minutely ciliolate. Marginal florets approximately 40, pistillate, corolla filiform, 3- to 4-fid, about 6 mm. long; disc florets about 20, hermaphroditic, corolla very slenderly infundibuliform, 5 to 6 mm. long, ca. 0.3 mm. in diameter, 5-fid. Achene 4 mm. long, light olive-brown, narrowly subcylindric, very markedly attenuate-rostrate, nerves 5, rounded, low, hairs short, scabrid, subappressed in shallow grooves between the nerves. Pappus copious, slender, exceeding the phyllaries and subequalling the florets, niveous to faintly tawny.

With somewhat the aspect of *S. quadridentatus* Labill. and doubtless related to it, but distinguished from it by denser pubescence, more numerous phyllaries scurfy-arachnoid all over the keel, and longer achenes.

JAVA: Tengger, "Senecio pyrophilus Z. et M. flos lutei. In arenosis volcanicis M. Tenanja-an (Tengger) 6-8000', XI." *Zollinger 2564* (P, 4 sheets, including one *ex* Hb. Sch. Bip. and annotated by him, isotypes); Bromo, 7000', 16 Sept. 1875, *Kuntze 6026* (NY, det. by him "*Erechthites quadridentata* DC. (Labil.)= *E. pyrophila* Sch. Bip."); "Ost-Java: auf dem Tengger bei und oberhalb Ngadisari von 2000-2400 m. ü. m. an den trockensten Stellen", *Koorders 37403, 37404, 37780* (K, det by Koorders as *E. hispidula* [sensu Benthami]); Res. Besoeki, Yang Plateau, 2100 m., 11 Aug. 1916, *Koorders & Koorders-Schumacher 43646* (K).

The packet on Schultz's isotype sheet bears a notation: ". . . . anth. ecaud., flores ex. foem., cent. hermaph." The reduction of this species to *Erechtites*, attributed by Miquel to "Schultz Bip. mss.", doubtless was made as a result of this dissection. Schultz appears not to have examined the style-arm apices, which in this material are definitely senecionoid. I do not find where Schultz himself published the combination, and conclude that both citations by Koorders are technically incorrect. In his "Exkursionsflora" he wrote of *E. pyrophila*: ". . . comp. *Erechtites hispidula* DC. Prodr. VI. (1837) 296; Benth., Fl. Austral. III. 660. Ich halte diese australische Art vermutlich fur identisch mit der japanischen [sic !] *E. pyrophila*." In this connection he cites *Koorders 37402* bis *37404* and *37780*, which, however, he publishes as *E. pyrophila*. The sheets at Kew are determined as *E. hispidula* DC., a misidentification which undoubtedly arose as a direct result of

his working at Kew with those Australasian sheets so thoroughly confused by Hooker and Bentham. Some components of *E. hispidula* Benth. do resemble S. *pyrophilus*, but these are misidentified and are not S. *hispidulus* A. Rich. It is to Koorders' credit that he never actually published the reduction implied by his comment.

But Koorders' provisional comment is reflected in the determinations of Compositae in Diel's "Beitrage zür Flora des Sarawaket-Gebirges". In commenting on the determination of *Keysser 40*, Mattfeld[32] wrote to the effect: that only a single Indonesian species, *E. pyrophila* from East Java, belonged in the New Zealand and Australian section of *Erechtites*, concerning which Koorders supposed that it was identical with the Australian *E. hispidula*, to which then Keysser's plant might also belong, but that he, alas, lacked authentic material of *E. hispidula*, and so had to determine it as *E. arguta* because of its pubescence and small capitula.

This confusion has prevented accurate identification of *Keysser 40*. I could not locate duplicates, and the specimens at Berlin and Breslau presumably are destroyed. The characters given by Mattfeld could apply to either S. *hispidulus* or S. *glomeratus* (*E. arguta auct.*). At least one can be certain from the small capitula that Keysser's plant was *not* S. *pyrophilus*. It could, of course, be an endemic novelty.

Although this species has somewhat the aspect of S. *quadridentatus* in the narrow elongate leaves, long-attenuate achene, and arachnoid pubescence, it is easily distinguished by its coarser leaves with an occasional exserted tooth on the lower ones, by its 16 to 18 phyllaries, by the very short pubescence which extends over the entire length of the phyllary on both its faces, and by the slightly longer and more slender achene. It differs from S. *squarrosus* by the phyllaries being pubescent and lacking the reflexed apices which give the latter its name; it also has much longer achenes and quite different leaves.

This species is known to me only from eastern Java, and is apparently the only species from Sundaland, west of "Wallace's Line". A careful search eastward along the summits of the Sunda Islands and particularly on Timor might conceivably turn up additional stations or, possibly, even related species. At present S. *pyrophilus* remains an interesting phytogeographical anomaly in the distribution of erechthitoid *Senecio*. It appears to be confined to the higher mountains at and above 2000 meters. From the notes of Zollinger and of Koorders it seems to prefer dry sandy habitats or volcanic ash.

7. SENECIO **laceratus** (F. Muell.) Belcher, comb. nov.

Erechtites lacerata F. Muell. Linnaea 25: 417. 1852.

Erechthites arguta Benth. Fl. Austral. 3: 659. 1866, *pro parte; non* (A. Rich.) DC. Prodr. 6: 296. 1838.

An erect annual with well-developed taproot, virtually glabrous. Stem unbranched below the inflorescence or with a few small branches from the medial

[32] Engl. Bot. Jahrb. 62:500. 1929.

axils, to 30 cm. high and disproportionately thick, up to 5 mm. in diameter at the base, striate, densely clothed above with numerous appressed and overlapping leaves. Leaves up to 8 cm. long, 3.5 cm. wide, usually not over three times as long as wide, ovate-lanceolate, the lower sometimes broadly oblanceolate, irregularly coarse-toothed, each tooth usually with several sharply acute denticulations, the upper leaves less irregular, auriculate and semi-amplexicual at the base, entirely glabrous. Inflorescence corymbose, rather crowded and compact especially before anthesis, glabrous except for occasional minute simple hairs on peduncles and bracteoles; bracts subtending main axes broadly denticulate-auriculate, rapidly tapering to acuminately triangular; bracteoles on peduncles broadly subulate, appressed; calyculus of a few short slender subulate bracteoles. Involucre of 10 to 13 phyllaries, much exceeded by florets and pappus; phyllaries glabrous, to 4 mm. long, 0.5 to 0.75 mm. wide at base, apices abruptly narrowed to acute or narrowly obtuse points often reflexed at maturity, lower half of phyllary strongly keeled and usually with a very narrow median nerve more or less prominently raised above the keel surface but sometimes submerged in it. Capitulum of 25 to 30 florets, of which about 10 are hermaphroditic. Marginal florets pistillate, corolla 4-, 5-fid, 3 mm. long, filiform, styles slightly exserted, style-arm apices bluntly truncated. Disc florets hermaphroditic, corolla 5-fid, slenderly infundibuliform, 3.5 mm. long, anthers minutely sagittate, style-arm apices truncate. Achenes 1.5 to 2 mm. long, short-cylindric, light brown and angular when immature, becoming plump, dark reddish brown and very indistinctly ribbed when mature, whole achene except the straw-colored annulus covered uniformly and rather densely with very short appressed papillose hairs, glabrate at maturity. Pappus white, capillary, slightly exceeding the florets.

Apparently confined to the interior of Australia.

AUSTRALIA. SOUTH AUSTRALIA: Cudnaka River, *Mueller* (MEL, paratype, *teste* Willis [isotype?]; Basedow Range, 20 July 1889, *Tietkins* (MEL, det. by Muell). NORTHERN TERRITORY: Bagot's Creek, Horn Expedition, 1894, *Tate* (K).

Bentham included Mueller's type of *E. lacerata* in his *E. arguta* complex, presumably because of its rather small capitula and compact inflorescence, plus the resemblance of its phyllaries to the larger glabrous ones of *S. hispidulus*, to which the larger part of his description of *E. arguta* (*S. glomeratus*) applies (see below). Mr. J. H. Willis has kindly informed me by letter that: "Bentham treated this as an inland, coarse and glabrous variety of *E. arguta;* in which he has been followed ever since at the Melbourne Herbarium". Mueller, at least as late as 1889, regarded it as a separate species, as shown by his determination of Tietkin's collection.

This distinctive species is especially noteworthy for the proportionately greater width of the leaf blade, approached among erechthitoid species only by *S. papuanus*, from which it is otherwise distinct. It is also almost entirely glabrous, a feature readily separating it from *S. glomeratus*, from which it can also be distinguished by the entirely regular corolla of the pistillate florets and by the uniformly and densely hairy (immature) achene.

The distribution can scarcely be indicated by the three specimens seen, except as "inland". The Tietkins and the Tate specimens are both of terminal fragments only; they have leaves somewhat smaller than those of the type, and are more mature. The description is based on all three specimens.

8. SENECIO **papuanus** (Lauterb.) Belcher, comb. nov.

Gynura papuana Lauterb. Fedde's Repert. Spec. Nov. 13: 242. 1914.
Erechthites papuana (Lauterb.) Mattf. Engl. Bot. Jahrb. 62: 442. 1929.
Senecio erechthitoides F. Muell. Trans. Roy. Soc. Victoria 12: 15. 1889; *non* Baker, Jour. Bot. 20: 171. 1882.
Erechthites erechthitoides (F. Muell.) Mattf., *l. c.*

Perennial; stem erect, leafy toward apex but lower leaves abscissed, very nearly glabrous, terete, striate. Leaves 4 to 5 cm. long, 1 to 1.5 cm. wide (or larger, below?), gradually reduced in size upwards, cuneate, oblong, sinuate-dentate with 3 to 5 teeth on each side, acute, glabrous above, minutely short-haired on nerves beneath, sometimes purplish beneath; lower subpetiolate and slenderly auriculate, upper sessile with coarser auricles. Inflorescences axillary and terminal, corymbose, of two to several capitula borne singly on peduncles 1 to 5 cm. long and bearing a few linear acute bracteoles 3 mm. long. Capitulum 11 mm. long, 4 to 5 mm. wide, with calyculus of 2 to 5 linear bracteoles subapical on the peduncle. Phyllaries 12 to 14, 7 to 8 mm. long, obtuse. Marginal florets pistillate, in two rows; corolla filiform, apex slightly expanded and 5-fid; style-arm apices slightly domed, without corona. Disc florets hermaphroditic; corolla slenderly infundibuliform, regularly 5-fid; style arms short, apices truncate and flat with corona of very short diverging hairs. Achene (immature) 3 to 3.5 mm. long, slenderly subcylindric, not attenuate-rostrate but with expanded apical annulus; pappus multiseriate, white, slightly exceeding phyllaries and equaling florets.

NEW GUINEA: Kaiser-Wilhelmsland, Bolan, 2400 to 3000 m., 1913, *Keysser 317* (cited by Mattfeld as in Hb. Breslau, fragment and photograph in Hb. Berlin, both presumably destroyed. Isotype, BM!); Papua, Albert Edward Mts., central part, 3680 m., "common weed on burnt areas", *Brass 4225* (NY); Mt. Wilhelm, on open places above the tree-line, 11000 to 15000 ft., 5 Aug. 1953, *Semple & Rayner* (MEL). Other specimens reported, but not examined by this author: Southeastern New Guinea, Crest of Owen Stanley Range, 1889, *MacGregor* (MEL, holotype of *Senecio erechthitoides* F. Muell., too fragmentary now to loan); Northeastern New Guinea, Sarawaket Mts., 2 March 1937, *Clemens 5682* (cited by Mattfeld).

As far as is known from these five widely scattered collections, this species is endemic in the mountains of eastern New Guinea at elevations above 2500 meters. Further explorations should clarify the nature and distribution of this distinctive outlier, which bears so little superficial resemblance to most other erechthitoid species of *Senecio*. It is similar to S. *laceratus* in the proportionately very broad leaf, but is readily distinguished from it by the size of the capitulum, almost twice as large as that of S. *laceratus*.

9. SENECIO RUNCINIFOLIUS Willis, Proc. Roy. Soc. Queensl. 62: 106, *pl. 7, figs. 34-37.* 1952.

Erechtites picridioides Sond. & Muell. Linnaea 25: 523. 1852; *non* Turcz. Bull. Soc. Nat. Mosc. 24: 200. 1851.

Erechthites mixta Benth. Fl. Austral. 3: 659. 1866, *pro majore parte;* Black, Fl. S. Austral. 4: 610. 1929; *non* (A. Rich.) DC. Prodr. 6: 297, 1838.

Herbaceous, pale green, glabrescent, 15 to 80 cm. high, young parts and leaf axils slightly arachnoid-pubescent. Leaves sessile, lanceolate, acuminate, largest 12 cm. long and 4 cm. wide at base, with up to 8 more or less retrorse sinuate-lobed segments on each side, uppermost leaves less toothed, with very long subfiliform apices. Inflorescence corymbose, lax, up to 100 capitula or more, peduncles slender, as much as twice as long as the calyculate capitulum. Involucre minutely arachnoid, glabrous in fruit; phyllaries 12-14, about 10 mm. long, 0.5 to 0.7 mm. wide, narrowly deltoid, with obtuse or subacute non-sphaceolate apex. Marginal florets pistillate, about 40, corolla slenderly filiform, usually 3-fid, often with one or two much deeper sinuses, giving a subligulate aspect, or sometimes unequally 4-fid, lobes papillose, thickened. Disc florets about 13, hermaphroditic; corolla infundibuliform, tube about 0.5 mm. in diameter at base of the 5 papillose-thickened lobes; anthers 5, about 1 mm. long, ecaudate; style arms about 0.33 mm. long, apices enlarged and recurved, without fused terminal papillae. Pappus silky, lustrous, at length exceeding florets by 2 mm. and phyllaries by as much as 5 mm. Achene 2.5 to 3 mm. long, about 0.3 mm. in diameter, subrostrate, 9- or 10-ribbed, with short suberect papilliform hairs on the ribs.

AUSTRALIA. SOUTH AUSTRALIA: Moorundee near Blanchetown, Murray River, Feb. 1851, *Mueller* (MEL *ex* Hb. Sonder, holotype); "towards Spencer's Gulf", *Warburton* (MEL). VICTORIA: "10 mi. west of Cohuna", Aug. 1946, *Vickery* (NSW); Berribee Tank, Murray River flood plain, 31 Aug. 1948, *Willis* (MEL); Cohuna, 8-9-1952 (NSW *ex* MEL, 39" tall, lower leaves to 10" long). NEW SOUTH WALES: "S. W. . . . of Piper's Hill", *Fraser* (K, syntype of *E. mixta* Benth.); " . . . Banks of the Lachlan, 1817", *Fraser* (BM, same gathering as preceding?); Warrego River, Western Plains, Sept. 1885, *Betche 15* (MEL); Warrego River, 12-8-1885 (*Betche* ?) (NSW); junction of Murray and Darling rivers, 1889, *Mrs. Holding* (NSW *ex* MEL); Zara, Wanganella, Dec. 1905, *Officer* (NSW, US); Brindingabba, Arrara, 1912, *Boorman* (NSW, "eaten by stock voraciously"); Nelia Yari (Menindee Dist.), 20 Nov. 1947, *Constable* (NSW).

This is a comparatively rare plant, apparently confined to riparian habitats mostly in the Murray River system, and to be expected in, but not yet reported from its extensions into extreme southern Queensland. Its scarcity may be explained by the note on Boorman's specimen.

As pointed out by Willis, this species was originally described from very depauperate specimens, and under a name already preoccupied. Bentham evidently recognized the relationship between the type and the more robust specimen from Spencer's Gulf. To these he united collections by Robert Brown and by Fraser, and identified the whole group with *E. mixta* DC. His description was entirely original and applies well to the Fraser specimens. Neither the description nor the specimens agree with Richard's type of *S. mixtus,* which belongs to the genus *Arrhenechthites.* The "Memory Cove, R. Brown" specimen cited by Bentham as

E. mixta appears to be "Senecio plebejus β, Memory Cove, *R. Brown 2282*" (BM!). Too over-mature for accurate identification, it belongs in the vicinity of *S. hispidulus*, with glabrous achenes. It is neither *S. mixtus* nor *S. runcinifolius*, definitely.

There should be no confusion between this species and the similarly named *S. runcinatus* Less., a true discoid *Senecio* from Mexico, which has a large leaf up to 30 cm. long and 12 cm. wide with its margin closely set with callus-tipped teeth and the runcinate lobes at essentially right angles, instead of reflexed. Lessing's species was erroneously placed in *Erechtites* by de Candolle, but must be excluded from that genus.

The material examined includes five of the six collections cited by Willis, through whose kindness I was able to examine them. The 1952 specimen from Cohuna appears to be part of a collection received by Willis after the publication of his paper. In a personal communication he stated that it has: "robust stems twice as tall as the limit fixed in my diagnosis", which was forty centimeters. I have emended the diagnosis accordingly.

10. SENECIO **wairauensis** Belcher, nom. nov.

Erechtites glabrescens T. Kirk, Trans. N. Z. Inst. 9: 550. 1877; Student's Fl. N. Z. 335. 1899; Cheeseman, Man. N. Z. Fl. ed. 1. 366. 1906; ed. 2. 1008. 1925; Illus. N. Z. Fl. 1: *tab. 110*. 1914; *non* DC. Prodr. 6: 295. 1838.
Erechtites prenanthoides DC. var. β *minor* Hook. f. Fl. N. Z. 141. 1853.

Stem herbaceous, erect, sulcate, 30 to 80 cm. tall, simple or sparingly branched above, glabrous throughout or with a few minute soft hairs in the grooves of the peduncles; leafy. Leaves suberect, crowded and overlapping, up to 15 cm. long, 5 cm. wide, gradually reduced in size upward usually with little change in proportions, sessile, often auriculate-amplexicaul or even sagittate below an attenuated narrowly winged petiole, or rarely merely sessile without auricles, varying from oblong-linear and obtuse to broadly oblong with a large ovate terminal lobe, sinuate-dentate, sinuate-lobate, or pinnatifid with denticulate lobes, glabrous or with soft hairs scattered on lower surface, especially along nerves, and more sparsely on upper surface, wings of petiole often ciliolate, blade very thin and membranous when dried, often purplish beneath. Inflorescences terminal and axillary, racemose in bud, becoming paniculate or subcorymbose. Capitula borne singly on slender peduncles of irregular length, often 1 to 2 cm. long, 3 to 8 (to 14) per branch, never solitary. Peduncles glabrous or with a few minute hairs in grooves; two or three linear-subulate bracteoles 3 to 5 mm. long on the peduncle proper, and one slightly longer bract subtending each peduncle. Phyllaries of involucre (10 to) 12 to 14, 6 mm. long, 0.5 mm. wide, glabrous, shorter than florets and pappus, keel bearing two broad low nerves with a narrow median fissure between them, margins scarious, apices shortly acute. Pistillate florets 10 to 15, hermaphroditic florets 20 to 25. Marginal florets pistillate or occasionally with some rudimentary stamens also, with style-arm apices truncate and without hairs; corolla 4-fid, filiform, 4 mm. long. Disc florets hermaphroditic, style-arm apices truncate with a marginal fringe of a few short hairs; corolla 5-fid, slenderly infundibu-

liform. Achenes long-tapered, subcylindric, non-rostrate but with slightly expanded annulus, faintly ribbed, glabrous or sparsely white-haired in the grooves, 4 mm. long. Pappus very fine, capillary, white, slightly exceeding florets.

NEW ZEALAND: SOUTH ISLAND: Roto Iti, *Kirk 824* (K, syntype and lectotype); Wairau Gorge, 3000 ft., *Cheeseman* (K, extreme marginal florets 3-fid, pistillate, next florets 4-fid with rudimentary stamens); Canterbury, Mt. Cook Dist., Hermitage 2500 ft., *Cheeseman* (K); 3000 ft., Jan. 1898, *Cheeseman* (NSW); 1860-61, *Sinclair & Haast 132, 25* (K, det. Hk. f. as *E. prenanthoides* var. β; left & center specimen, right specimen is *S. dunedinensis*); Canterbury, Southern Alps, 2000-4000 ft., 1862, *Haast 527* (K); Otago, *Lyall* (K, very immature); Lake District, *Hector & Buchanan 2* (K, very immature); Milford Sound, *Lyall* (K ex Hb. Benth., det. as *E. prenanthoides* var. β, leaves very narrow and scarcely lobed; K ex Hb. Hook., right specimen only, left is *S. biserratus*). STEWART ISLAND: "In arenosis maritimis", *Godey* (P, immature, peduncles lanate, det. *E. arguta*). Also reported by Cheeseman from a few localities on North Island.

Kirk's sketchy original description of this endemic New Zealand species was only slightly amplified by him later. Cheeseman gave an improved description and a good figure. This is a well-defined, valid species which, because of its truncated and unappendaged style arm, is certainly a *Senecio*, not an *Erechtites*. The new epithet is based on Kirk's identification of the original locality of Travers.

Hooker's diagnosis of *E. prenanthoides* var. *minor* is simply, "var. β, *minor*; foliis sinuato-lobatis subpinnatifidisve". In the description of the species, further, the leaves are, "all sharply toothed, lobed and pinnatifid throughout their length in var. β." But the two specimens cited by Hooker for this variety, "Milford Sound and Otago, Lyall", unmistakably are referable to this species and not to *S. minimus* (= *E. prenanthoides* DC.). Furthermore, in Hooker's annotated copy of the 'Flora of New Zealand' in the library at Kew he has written, "Also Haast 132, 25", in the margin beside var. *minor*. This sheet, determined as var. β in Hooker's script, is *S. wairauensis* except for the right-hand specimen.

11. SENECIO **dunedinensis** Belcher, nom. nov.

Erechtites diversifolia D. Petrie, Trans. & Proc. N. Z. Inst. 19: 323-324. 1887; *non Senecio diversifolius* Du Mort., 1827.

A slender erect herb from a perennial rootstock, unbranched or only sparingly branched below the inflorescence, and the inflorescence more or less branched. Stem shallowly sulcate, glabrescent or sparsely cottony, leafy for its entire length, the lower leaves slightly crowded. Radical leaves to 3.5 cm. long, 6 mm. wide, oblanceolate, long-attenuate to subpetiolate; cauline leaves as large as 6 cm. long, 5 mm. wide, linear-lanceolate to linear-oblong, shortly attenuate to sessile but not clasping; margins remotely sinuate-denticulate on lower leaves, becoming subentire on upper leaves; blades glabrescent to sparsely arachnoid beneath, nowhere hispid. Inflorescences terminal and axillary, corymbose, with relatively few capitula, at first moderately congested, becoming very lax at full maturity, peduncles glabrous or sparsely arachnoid, with 2 to 6 subulate purple-tipped bracteoles 2 mm. long or less. Capitula calyculate; involucre of 12 to 14 phyllaries; phyllaries 5 to 5.5 mm. long, shorter than florets and pappus, sparsely and very shortly glandular-

pubescent, apices rather suddenly narrowed and then prolonged in a bluntly acuminate point, shortly ciliolate and darkened, keels basally two-ridged with a median nerve emerging midway and becoming more prominent as the ridges are reduced, margins scarious. Pistillate florets marginal in two rows, corolla 4-fid, lobes thick-tipped; hermaphroditic florets central, 5-fid, lobes thick-tipped. Achenes somewhat fusiform, slightly constricted below the expanded rim, 3 mm. long, nerves prominent, rounded, rather narrow, grooves very narrow, hairs short, white, suberect on or beside the nerves but not in the bottom of the grooves. Pappus very fine, slender, equaling the florets and much exceeding the phyllaries.

NEW ZEALAND. SOUTH ISLAND: Otago, Naseby, 1800 ft., Dec. 1892, *W. Petrie 858* (K, det. as "*Erechtites diversifolia* D. Petrie, *ex* Herb. W. Petrie, Dunedin."); interior of Otago, *D. Petrie* (NSW, undated); Prov. Canterbury, 1860-61, *Sinclair & Haast 132, 25* (K, right-hand specimen only, others being S. *wairauensis*); Canterbury, Godley River bed, *Haast 617* (K).

Petrie did not designate a type nor cite any specimens for *E. diversifolia.* I do not find that any other author has designated a type, although several gatherings have been listed. I did not, in limited correspondence, locate a collection by Petrie dating from 1887 that might have served as his type. The Petrie specimen at Kew, collected some years later, agrees with the description and could serve as neotype if further search for the holotype should be unsuccessful.

Cheeseman[33] reported this species on North, South, and Stewart Islands, and common in some places. Judging from its scanty representation in the herbaria, it must be rather rarely collected. I have named it S. *dunedinensis* in allusion to the type locality. Although apparently not very close to any other erechthitoid species, its leaf and achene suggest S. *wairauensis*, from which it can be distinguished by its smaller capitula and shorter phyllaries.

12. SENECIO QUADRIDENTATUS Labill. Nov. Holl. Pl. Spec. 2: 48, *tab 194.* 1806.

Neoceis tomentosa Cass. Dict. Sci. Nat. 48: 458. 1827, *nom. prov.*
Senecio prenanthoides A. Rich. Sert. Astrolabe, 96. 1834, *non E. prenanthoides* DC. Prodr. 6: 296, 1838, which is S. *minimus.*
Erechtites quadridentata (Labill.) DC. Prodr. 6: 295. 1838, *et auct.*
Erechtites glabrescens DC. Prodr. 6: 295. 1838; *non* T. Kirk, Trans. N. Z. Inst. 9: 550. 1877.
Erechtites glandulosa DC. Prodr. 6: 295. 1838.
Senecio glandulosus Cunningh. *apud* DC. *ex* Sch. Bip. Flora 28:498. 1845.
Senecio glabrescens (DC.) Sch. Bip. Flora 28: 498. 1845.
Erechtites incana Turcz. Bull. Soc. Nat. Mosc. 24: 85. 1851.
Erechthites quadridentata var. *glabrescens* (DC.) Benth. Fl. Austral. 3: 660. 1866, *pro parte.*
Erechtites erecta F. Muell. *ex* Lange, Bot. Tids. 4: 6. 1874.

Perennial; stems erect, striate, densely incanous-arachnoid to lanate when young, more or less glabrate later, nowhere hispid or scabrid, sparingly or much branched below the inflorescence, with branches suberect to erect. Leaves linear to lanceolate and as much as 9 cm. long and 0.3 cm. wide or sometimes the lower

[33] Man. N. Z. Fl. p. 1007. 1925.

ones oblong-lanceolate, sessile, attenuated toward the base, sometimes with minute linear and simple auricles, more or less minutely and distantly callose-denticulate, usually revolute, typically densely arachnoid to lanate especially when young, sometimes becoming subglabrous especially on upper side, acute to subacuminate. Inflorescences terminal and axillary, forming corymbose cymes, slightly congested becoming lax, usually densely arachnoid, sometimes glabrate; capitula calyculate with linear bracteoles about 2 mm. long; phyllaries of the involucre 11 to 13, 6.5 to 8 mm. long, 0.4 to 0.5 mm. wide, at first arachnoid later glabrate towards the apices, 2-nerved with nerves prominent on the lower third only, acuminate, ciliolate. Marginal florets pistillate with filiform (3-) 4-fid corolla 5.5 to 6 mm. long. Disc florets hermaphroditic with slenderly infundibuliform 4- (5-) fid corolla with blunt lobes papillose-thickened apically. Achenes 2.5 to 3 (to 4) mm. long, straight or slightly arcuate, more or less attenuate-rostrate, narrow grooves between broadly flattened ribs beset with short white subappressed hairs, reddish or olive-brown at maturity. Pappus multiseriate, niveous, exceeding the phyllaries by 2 mm., equalling the florets.

AUSTRALIA. TASMANIA: "Nova Hollandia in capite Van-Dieman", *Labillardière* (FI, holotype; BM, K); Port Dalrymple, *R. Brown 2283* (K, except for center specimen); Gun Carriage Island, 23 Oct. 1844, *Gunn 1978* (K); Hobart, 1870, *Hannaford* (HO); "Corra Leen", 13 Feb. 1878, *Beccari* (FI); Blackman's Bay, Feb. 1929, *Rodway H506* (K); "Between Nat'l. Park and Westerway in railway cutting", 30 Nov. 1929, *Comber 1757* (K). NEW SOUTH WALES: Port Jackson, *Gaudichaud 4* (P, holotype of S. *prenanthoides* A. Rich.; G. Prodr.); Barham, 13 Oct. 1949, *Vickery 577* (K, US). VICTORIA: Wendu Vale, 17 Nov. 1843, *Robertson 691* (K); Werribee, 24 Sept. 1892, *Morrison* (K); 14 Jan. 1924, *Williamson* (F, center and right; left is S. *glomeratus*); Melbourne, Tooroorong, 8 Nov. 1936, *Mauritzon* (S). SOUTH AUSTRALIA: "Austr. felix, Exp. Novara", *Mueller* (W); "Nov. Holl. meridional.", *Mueller* (FI, W); Mt. Lofty ranges, Sept. 1903, *Koch 837* (K). WESTERN AUSTRALIA: Swan River, *Drummond 379* (FI; K, 4 sheets; W; isotypes of *E. incana* Turcz.); Freemantle, *Hugel* (W); Toodyay, *Preiss 73, 126* (S).

NEW ZEALAND. NORTH ISLAND: Wellington (W); Woodhill, Kapara, Oct. 1882, *Cheeseman* (US). SOUTH ISLAND: Canterbury, Waiau Marble Quarry, limestone cliff, Dec. 1936, *Lothian* (K); Prov. Canterbury, 1860-61, *Sinclair & Haast 321* (W); Awatere, *Kirk 17* (US); Central Otago, Alexandra, 15 Nov. 1929, *Sledge 391* (K).

TIMOR: *Decaisne* (P).

This was the first of the erecthitoid species of *Senecio* to be published. The type material, including the holotype sheet which has pinned to it the manuscript draft of the original description plus four specimens, reveals much of the range of variation in habit, leaf shape, and pubescence of this species. Subsequent collections have added to the known variation, and several extremes have received specific rank. There has been apparent introgression with allied species, especially S. *hispidulus*, and some such states have also been described as species. It is doubtful if a really satisfactory disposal of all the names in this complex can be made without intensive experimental investigation.

Richard redescribed S. *quadridentatus* Labill., making the corolla lobes nonglandular. He then described S. *prenanthoides* to contrast sharply with his S. *hispidulus*. But both his specimens of the former two have corolla lobes glandu-

lose-papillose, and are in full agreement except for pubescence. The inflorescence of *Gaudichaud 4*, the holotype of S. *prenanthoides*, is virtually glabrous, although what pubescence there is, particularly on the phyllaries, is arachnoid, as on Labillardière's types. These extremes of pubescence are united by specimens showing all intermediate degrees, and by some which show one extreme on one branch and the other on another. I can not justify retaining S. *prenanthoides* even as a form.

The type of *E. glabrescens* DC., *Cunningham 134* (G!), is quite comparable to *Gaudichaud 4* in pubescence but has less revolute leaves. Broader subpetiolate basal leaves also give this and similar specimens a somewhat different aspect, although such leaves probably develop normally in this species but are usually lost before maturity. They certainly were present on seedlings raised from Tasmanian achenes furnished me by Dr. Curtis. This specimen is identical in floral details with the type of S. *quadridentatus*.

The variety *glabrescens* Benth., defined by specimens determined by him at Kew, included not only the specimens of *Cunningham 61* which accurately represent *E. glabrescens* DC., but also such diverse elements as *Adamson 343* and *Gunn 508* (Circular Head), which appear to be hybrids between S. *quadridentatus* and S. *hispidulus* A. Rich. Bentham regarded *E. glandulosa* DC. as a luxuriant state of *E. quadridentata*. The type, *Cunningham 141* (G!), is definitely related to S. *quadridentatus* by achene, leaf shape, and lanate-arachnoid pubescence, but differs in being less pubescent and in having larger and auriculate leaves. I agree with Bentham, although the auricles may be evidence of hybridity with S. *hispidulus*.

Erechtites erecta Mueller *ex* Lange has never been indexed as published, probably because the name occurred in a discussion of the affinities of *E. Muelleri*, written in Danish. I am indebted to Mr. W. C. Worsdell at Kew for a translation of Lange's article, from which I quote the passages pertaining to *E. erecta*:

> "This second name of Müller's (*E. erecta*) is ascribed to a plant which differs from that here figured [*E. Muelleri*] by denser and longer, very loose felt over the entire plant (also on the upper surface of the leaves), by stiff and erect, nearly adpressed, narrow linear leaves, with strongly reflexed margins and almost devoid of teeth, by more rigid branches, more congested heads, and a distinct beak on the achene. This *E. erecta* F. Müll., sched. pl. exsicc., (not mentioned in Bth. & Müll.) agrees fairly closely with the original S. *quadridentatus* Labill., fl. nov. holl. tab. 194, and with the description of the same in DC. It perhaps answers to the var. *Gunnii* Bth. & Müll., whose description runs thus; 'very wooly white, leaves mostly petiolate, oblong, entire with a few remote teeth'. But it must be noted, that most leaves on the Müller specimens are not stalked, but sessile, and that they are not 'oblong' but just narrowly linear . . ."

I consider this valid publication.

I have not seen Lange's type, but have seen a number of sheets determined as *E. erecta*, some by Mueller himself. These specimens bear out Lange's description, except that the achenes vary some in the attenuation of the neck. The differences between these specimens and typical S. *quadridentatus* are in the direction of greater xeromorphism, and probably are an ecological adptation to the more arid conditions of South Australia, from which most of the authentic material has come. Lange's tentative identification with var. *Gunnii* Benth. (= *E. Gunnii* Hk. f.) is of course

not supported by comparison with Hooker's type. I regard this simply as an extreme of S. *quadridentatus*, lacking sufficient discontinuity from the type to be recognized.

13. SENECIO **gunnii** (Hook. f.) Belcher, comb. nov.

Erechtites Gunnii Hook. f. Lond. Jour. Bot. 6: 122. 1847; Fl. Tasm. 1: 220, *tab* 63. 1860. *Erechthites quadridentata* var. *Gunnii* (Hk. f.) Benth. Fl. Austral. 3: 660. 1866.

Perennial from rhizome, annual shoots herbaceous or slightly woody at base. Stems erect, arachnoid to lanate but eventually glabrate. Leaves sparsely arachnoid and hispidulous above, moderately lanate and hispid beneath; lower ones obtusely oblanceolate or obovate-lanceolate, 8 (to 12) cm. long, 1.5 (to 1.8) cm. wide, subentire but minutely denticulate, base long-attenuate and subpetiolate, slightly broadened at attachment and sometimes with small auricles 1 to 2 mm. long; upper ones smaller, sessile, not attenuate. Inflorescences a corymbose-panicle, varying from rather compact to lax, branches lanate to arachnoid or eventually glabrate, capitula several to numerous on rather short peduncles, calyculi lanate; phyllaries 11 to 13, 6 mm. long, glabrous, minutely glandular-papillose, or basally sparsely arachnoid, more or less prominently keeled, 2-nerved, often purplish, apices acuminate, ciliolate; marginal florets pistillate, corolla filiform, apices of the 4 lobes thickened-glandulose. Disc florets hermaphroditic, corolla subfiliform, slightly and abruptly dilated above, apices of the 5 lobes thickened-glandulose; anther bases obtusely lobulate. Achenes 3 mm. long, slightly arcuate, light brown, strongly ribbed, with short white hairs in deep grooves between the ribs or lacking, apex definitely attenuate-rostrate. Pappus slightly exceeding phyllaries and florets, white.

AUSTRALIA. TASMANIA: Marlboro, Jan. 1841, *Gunn 700/1842* (K, syntype; NSW); Arthur's Lakes, 17 Jan. 1843, *Gunn 700* (K, syntype; NSW); 1844, *Gunn 700* (K *ex* Hb. Benth.); Western Mountains, 18 Feb. 1843, *Gunn 700* (K, 3 on same sheet as next), *Lawrence 297* (K); Table Mountain, April 1804, *R. Brown 2284* (BM, 2); *Hugel* (W); Mt. Wellington, 19 Feb. 1878, *Beccari* (FI); Mount Field East, 4000 ft., March 1906, *Maiden* (NSW); Mt. Wellington, 3800′, March 1944, *Curtis* (HO); near Great Lake on Bronte Road, 27 Jan. 1949, *Burbidge 3426* (HO). VICTORIA: Yarra Yarra, *Mueller* (K); (?) Mt. St. Bernard, Jan. 1899, *Walker* (NSW); Mt. Hotham, Jan. 1900, *Maiden* (NSW); Buffalo Mt., 4300 ft., 19 Jan. 1913, *Cambage 3753* (NSW). NEW SOUTH WALES: Watcha Road, Dec. 1893, *Kretschmann* (NSW); Mt. Kosciusko, Jan. 1898, *Maiden* (NSW); Thredbo River, Jan. 1899, *Maiden & Forsyth* (NSW); Bemberi Peak, 6100 ft., 15 Jan. 1912, *Cambage 3441* (NSW); Kosciusko, 9 March 1949 *Skottsberg* (NSW, S); near Charlotte Pass, 14 March 1949, *Skottsberg 174* (S).

In the original publication of *Erechtites Gunnii*, Hooker merely stated: "Hab. Alpine situations, *Gunn.*" In the 'Flora Tasmaniae' he cited *Gunn 700*, and " . . . Arthur's Lakes, Marlborough, etc. *Lawrence, Gunn.*" One sheet of *Gunn 700* at Kew has two gatherings, "Gunn 700, Arthur's Lakes, 17/1/45, V. D. Land", and "Gunn 700/1842, Marlboro, 5/1/41." Beside the former are the diagnostic figures drawn for plate 63 in the 'Flora Tasmaniae'. Below the latter specimen is "*Erechtites Gunnii*" in Hooker's script. I interpret these gatherings as the syntypes. This same sheet has been annotated by Bentham as the variety.

The systematic status of S. *gunnii* is still somewhat uncertain. It is surely closely allied to S. *quadridentatus*. That it may be a hybrid between, say, S. *minimus* and S. *quadridentatus*, with perhaps some introgression into S. *hispidulus*, can not be ruled out entirely without cytogenetic study. The principal argument against its hybridity is its lack of variability in those features which intergrade in the group of putative hybrids between S. *hispidulus* and S. *quadridentatus*. On the other hand, Bentham may have been right in considering it a variety of S. *quadridentatus*. Pending further clarification, I side with Rodway[34] in considering it a species.

From the elevations given by the collectors, S. *gunnii* appears to be alpine and subalpine in distribution. The only other ecological datum available to me is that of Gunn, preserved in the type cover at Kew: "Very common on the summits of the Western Mountains, growing in moist places in the pasturage."

14. SENECIO GLOMERATUS Desf. *ex* Poiret in Lam. Encyc. Suppl. 5: 130. 1817.

Senecio glomeratus Desf. Cat. Hort. Paris. 124. 1815, *nomen nudum; ex* Link, Enum. Hort. Berol. 2: 325. 1822.

Erechtites glomerata and vars. *subincisa* and *polycephala* DC. Prodr. 6: 297, 1838.

Neoceis microcephala Cass. Dict. Sci. Nat. 34: 388. 1825.

Senecio argutus A. Rich. Fl. Nouv. Zél. 258, 1832; Sert. Astrolabe, 104. 1834; Endl. Prod. Fl. Norf. 51. 1833; *non* Kunth in HBK. Nov. Gen. & Spec. 4: 183, 1820.

Erechtites arguta (A. Rich.) DC. Prodr. 6: 296. 1838; Cheesm. Man. N. Z. Fl. 364. 1906; *ibid.* ed. 2, 1007. 1925; Hook. f. Fl. N. Zeal. 1: 142. 1853, *pro parte;* Fl. Tasm. 1: 219. 1860, *pro parte;* Benth. Fl. Austral. 3: 659. 1866, *pro parte;* Rodway, Tasm. Fl. 95. 1903, *pro parte;* Black, Fl. S. Austral. 4: 610. 1929, *pro parte.*

Senecio Lessonianus Sch. Bip. Flora 28: 498. 1845; *non* Steud. Nom. ed. 2, 2: 562. 1841.

Senecio plebeius Banks & Soland. *ex* Hook. f. Fl. N. Z. 1: 142. 1853, *ut syn., nom. nud.*

Senecio Lessoni F. Muell. Ann. Rept. Gov't. Bot. 26. 1858, *nom. nud.* (publ. as *nom. nov.* for "E. angusta", error for *E. arguta*?).

Annual (?); stem erect, herbaceous or slightly woody at base, simple or branching above, more or less densely arachnoid-pubescent, sometimes glabrate below, often sublanate on juvenile parts and inflorescences. Leaves ovate-lanceolate to linear-lanceolate, variable in length and width and in length-width ratio but usually more than three times as long as wide, denticulate and revolute to irregularly and coarsely sharp-toothed to sinuate-lobate with obtuse sinuses and callose-denticulate deltoid lobes to more or less profoundly pinnatifid with long lanceolate denticulate or subincised acute or obtuse lobes, sessile, usually auriculate; lower leaves sometimes subpetiolate above the auricles; sparsely arachnoid to glabrate above, more densely arachnoid beneath. Inflorescences terminal and axillary, forming a congested corymbose panicle, arachnoid to lanate, rarely glabrate after anthesis, capitula small, 5 to 7 mm. long, 2 to 3 mm. wide, borne singly or in small clusters, calyculate; phyllaries 11 to 13, 3.5 to 5 mm. long, usually near 4 mm., with basal one-third to one-half usually densely short-arachnoid to lanate, or rarely glabrate after fructescence, obscurely 2- to 3-nerved, acute to acuminate, minutely ciliolate at the apex. Marginal florets pistillate, occasionally with rudimentary stamens, with corolla filiform, usually 3-fid, sometimes irregularly 2-fid and subligulate. Disc

[34] Tasmanian Flora. pp. 94-95. 1903.

florets hermaphroditic, with slenderly infundibuliform corolla 4-, 5-fid, and with style-arm apices truncated. Achene short-subcylindric, 1.5 mm. long or less, not attenuate-rostrate, ribbed, with short whitish or tawny subappressed hairs between the ribs. Pappus white, capillary, exceeding involucre, subequalling florets.

CULTIVATED: "*Senecio quadridentatus* Labill. *Senecio glomeratus* h. par." (FI, Hb. Webb. *ex* Hb. Desf., 2 pieces, right-hand one designated as neotype); "*Senecio aggregatus* hort. Paris., 1813" (P); "Jardin des Plantes . . . October 1816" (K *ex* Hb. Gay, det. as S. *glomeratus* Poir.); "*Senecio glomeratus* h. pl. 1815" (G Prodr., syntype of *E. glomerata* var. *subincisa* DC.).

AUSTRALIA. TASMANIA: "Nouv. Holl., détr. d'Entrecasteaux", iter *Baudin* (P, det. as S. *argutus* by Richard); "Nouv^e Hollande, côte merid^e., Mus. de Paris 1821", ex itin. *Baudin* (G Prodr., holotype of *E. glomerata* DC. var. *typica*); "Tasmania 1833", *Gunn 408* (K, right-hand specimen only, left is a hybrid); "Van Dieman's Land, 1833", *Gunn 408* (K); C. *Stuart* (W, 2); Adventure Bay, Feb. 1906, *Maiden* (NSW); Birch's Bay, 400 ft., Jan. 1931, *Rodway 75* (K); Bishopsbourne Creek, Jan. 1931, *Rodway 122* (HO, K); Bridgeport, April 1946, *Wilson* (HO); Somerset, Feb. 1948, *Curtis* (HO). WESTERN AUSTRALIA: "Riv. des Cygnes", iter *Baudin* (P); Swan River, 1839, *Drummond* (K, 2), *Drummond 257* (W). SOUTH AUSTRALIA: "Austra. felix, Novara Expedit." *Mueller* (K; W, 2, marginal florets frequently more or less ligulate, next row sometimes perfect and infundibuliform, closely approaching true radiate structure); Aldgate, Jan. 1907, *Maiden* (NSW). VICTORIA: Wendu Vale, *Robertson* (K); S. E. of Oakleigh, Dec. 1892, *Morrison* (S); Jan. 1924, *Williamson* (F); Frankstone, Nov. 1936, *Mauritzon* (S); Sandringham, Nov. 1936, *Meebold 21799* (NSW). NEW SOUTH WALES: Mt. Koscuisko, 5500 ft., Jan. 1898, *Maiden* (K).

NEW ZEALAND. NORTH ISLAND: "Ad riv. Punakitere, Nov. 1874", *Berggren* (S); Auckland, Panmore, *Kirk* (F); Auckland, *Cheeseman* (F); Wellington, "open places, sea to 2000 ft., common," March 1909, *Travers* (G Deless., W). SOUTH ISLAND: "Havre de l'Astrolabe, détroit de Cook" (P, holotype of S. *argutus* A. Rich.); Lake Dist. in the bush, March, *Hector & Buchanan 3* (K). WITHOUT SPECIFIC LOCALITY: "*Senecio plebius*" 1769-70, *Banks & Solander* (BM, S, US); "Nouvelle Zélande, voyage de l'Astrolabe et de la Zélee, 1838-1840" (K); "N^lle. Zélande, Voyage de M. Bernard", 1847, *Vedele* (P).

UNITED STATES. CALIFORNIA: Vance's Camp 17, June 1911, *Smith 3849* (F); Crescent City, June 1928, *Thompson 4537* (F); San Francisco, July 1930, *Rose* (S); Mendocino County, July 1931, *Jones 29097* (BM, F); San Mateo Co., open rocky hills, Sharp Park, 1936, *Rose 13980* (W); Humboldt County, Spruce Cove, Trinidad, *Parks 24033* (BM, F, S).

Poiret's description is rather difficult to apply literally to the herbarium material to which his epithet has been applied, the disagreement being mainly with leaf shape and pubescence. The name was based on a living plant, and there might be no holotype. I have, however, obtained from Florence a sheet with two specimens from Desfontaines' herbarium, which is ticketed "*Senecio quadridentatus* Labillard. Compos. h. p., S. *glomeratus* h. Par." The latter determination is in the same script and ink used on the holotype of S. *minimus* Poir., and is, I believe, in Poiret's writing. I therefore select the right-hand specimen on this sheet as neotype of *Senecio glomeratus* Desf. *ex* Poir.

The two specimens have somewhat different leaf forms. The neotype approximates Poiret's description of the leaf as linear-lanceolate, incised or toothed, but clearly shows a few pinnatifid leaves near the base. The specimen on the left accords well with the description of S. *glomeratus* Desf. *ex* Link as petiolate and pinnatifid. It also agrees with a number of specimens bearing determinations as

S. *glomeratus* Desf., most of which, like the one in the Prodromus Herbarium, were taken from cultivation. These two specimens are in excellent agreement in floral characters; both were included in the determination, and I see no basis for separating them. Nor could I justify forming subspecific categories of this variable species on such an unstable basis as these foliar differences, when every degree of intergradation exists in the material.

Richard based S. *argutus* on a scrappy specimen, little more than an inflorescence, from New Zealand. The floral characters of this specimen, and of a somewhat larger pair of branches from Richard's herbarium, ticketed simply as "*Senecio argutus* nob., N^lle^ Zélande", are unmistakably those of S. *glomeratus*. The same is true for the sheet of six fragmentary specimens collected by the naturalists of the Baudin expedition from "Nouv. Holl. détr. d'Entrecasteaux" (Tasmania), which Richard determined as *Senecio argutus*. He rightly cited these as extending the range of this species to Australia.

The d'Urville specimen cited by de Candolle in the 'Prodromus', in contrast to the one retained by Richard, has quite pinnatifid leaves but agrees with Richard's type and description in pubescence and floral features. This New Zealand specimen forms the basis for "*Erechtites arguta* . . . *Senecio argutus* A. Rich. et Lesson. . . . non Kunth" in the 'Prodromus'. De Candolle also maintained *E. glomerata* as a distinct species, and even placed it in a different section of the genus! The holotype of his typical variety is a specimen "ex itin. Baudin", which is almost an exact replica of the left-hand specimen on the Baudin sheet cited by Richard as S. *argutus*. These two specimens likely are of the same gathering, possibly even from the same plant!

With this merely sinuate-dentate specimen de Candolle associated two coarsely lobate to pinnatifid specimens as *E. glomerata* var. *subincisa* DC. This was based on "*Senecio glomeratus* Desf.! hort. Paris 1824 [sic!]. Poir. Suppl. 5. p. 130. Link enum. 2. p. 325. *Neoceis microcephala* Cass. dict. 34. p. 388. (v. v. et s.)". These specimens approach the left-hand specimen from Desfontaines' herbarium, but do not quite equal it in depth of lobing and slenderness of lobes. One is ticketed as "*Senecio glomeratus* h. pl. 1815", and is probably the basis for the exclamation mark after the basonym, since with de Candolle that meant that he had seen the "type". The other specimen establishes the earliest date, 1807, which I find for this species in cultivation.

The type of *E. glomerata* var. *polycephala*, from Port Western on Bass Strait, has a somewhat larger capitulum with larger and wider bracts than usual, and three large leaves which are merely shallowly dentate. Although I have seen no other specimen which exactly duplicates this, it is definitely a part of the S. *glomeratus* complex. It is linked to the more typical state by several collections, notably the Travers specimen from Wellington, on which the phyllaries were 5 mm. long and the leaves similarly large. I therefore regard var. *polycephala* as only a luxuriant state of S. *glomeratus*.

J. D. Hooker disregarded *E. glomerata* and took up *E. arguta* in his floristic papers on Australasia. In attempting to deal with the extreme polymorphism shown by the (hybrid) material in his herbarium,[35] he created four varieties of *E. arguta* for Tasmanian specimens, and later[36] formed two varieties for New Zealand specimens. These specimens are at Kew, duly annotated.

Hooker's var. α of New Zealand is typified by Akaroa, *Raoul 31* (K), which I regard as a hybrid between S. *glomeratus* and S. *hispidulus* (probably var. *scaberulus*). His var. β of New Zealand agrees well enough with typical S. *glomeratus*. His var. β *glabrata* of Tasmania is typified by two mixed sheets at Kew, of which that part which most closely matches the brief description again appears to be another hybrid of the above parentage, while the other specimens are more like pure S. *glomeratus*. Hooker attributed his var. γ *asper* to S. *asper* Cunn. I have failed to find this name published, and if it were it would be a later homonym of S. *asper* Ait. This variety is typified by *Hooker 1125* and by "near Woolworth, 25 Nov. 1836, *Gunn 843*". These were compared with Richard's types, and agreed most closely with S. *pusillus* A. Rich., which I consider a depauperate state of another hybrid between S. *glomeratus* and S. *hispidulus*. Var δ *obovata* is good S. *glomera-* *843/1842*", is much the same type of plant as the hybrid var. α of New Zealand. *tus*. Var. ε, without an epithet, typified by "Circular Head, 11 Dec. 1837, *Gunn* Thus *E. arguta* Hk. f. includes both S. *glomeratus* and some hybrids of it with S. *hispidulus*.

Bentham consolidated these errors by accepting as *E. hispidula* a mixed group of large-headed specimens including S. *squarrosus*, and by placing the then nameless specimens of S. *hispidulus*, along with hybrids of it with S. *glomeratus*, in with the true S. *glomeratus* material as *E. arguta* (*sensu Benthami*). A large part of Bentham's description of *E. arguta* applies much more to S. *hispidulus* than to S. *glomeratus*, and some parts apply only to the former and its hybrids.

Of modern authors, only Cheeseman seems to have had an accurate conception of this taxon, under the name of *E. arguta* DC. Neither his key to species nor his description reveals any confusion with S. *hispidulus*. Rodway followed Bentham exactly. Black similarly followed Bentham, even to the inclusion of his var. *microcephala*, which is better treated as a distinct species (see S. *laticostatus*).

15. Senecio **laticostatus** Belcher, nom. nov.

Erechthites arguta var. *microcephala* Benth. Fl. Austral. 3: 659. 1866; *non Senecio microcephalus* Phil. 1894.

Stem striate, arachnoid, apparently simple below the inflorescence, basal part unknown. Leaves to 6 cm. long, 2.5 cm. wide, pinnately lobed, lobes triangular to oblong, sharply toothed, base auriculate, semiamplexicaul especially upward, sparsely hispid and arachnoid and rough above, copiously arachnoid beneath. Inflorescence a compact corymbose panicle of numerous capitula, few or solitary on

[35] Lond. Jour. Bot. 6:122. 1847.
[36] Bot. Antarct. Voy. II. Fl. N. Z. 1:142. 1853.

peduncles from 0.5 to 3 cm. long, branches striate, arachnoid, peduncles strongly striate, moderately arachnoid, the linear-lanceolate entire bracts virtually glabrous, receptacles lanate. Capitula short, comparatively broad; phyllaries of involucre about 12 to 13, slightly lanate at the base, glabrous at the apex, 3.5 to 4 mm. long, 0.5 to 0.75 mm. wide at base, the center portion about 0.1 to 0.2 mm. wide between the scarious margins which rapidly taper toward the apex so that the apical 0.75 to 1.0 mm. is essentially without scarious margins and is long and slenderly acuminate, even in early bud, when the phyllaries may equal or exceed 3 mm. while the florets are still less than 1 mm. long. Marginal florets pistillate, 20 to 25, corolla slender, 3- or 4-fid, 2.5 to 2.75 mm. long. Disc florets hermaphroditic, 3 or 4 in number, corolla 3.0 to 3.25 mm. long, thick, apex 1.5 mm. in circumference, with 4 obtusely deltoid lobes, each 0.4 mm. wide and 0.3 mm. long, anthers 1 mm. long; florets at anthesis exceeding phyllaries by about 1 mm. Achene (somewhat immature) olive-green, 1.5 mm. long, cylindric, non-attenuate, glabrous, having 5 extremely narrow thin high ridges extending its full length. Pappus hairs white, unequal in length but mostly equaling or slightly exceeding the phyllaries, shorter than the florets.

Known to me only from the holotype collection.

AUSTRALIA: Flats beyond the Brodribb River, Jan. 1855, *Mueller* (MEL holotype).

Mueller gave to the type specimen a manuscript name in *Erechtites;* Bentham adopted his trivial as the varietal epithet. The new epithet, *laticostatus*, alludes to the unique fin-like ribs of the achene. The type specimen has a somewhat anomalous growth pattern, as though it had been broken over prior to flowering. The leaves are highly suggestive of the more coarsely lobate forms of *S. glomeratus*, differing unreliably in having somewhat coarser denticulations on the median lobes. The floral features, however, are unique, particularly the short broad 4-fid corolla of the few disc florets, with bluntly deltoid lobes, the short phyllaries with acuminate non-scarious apices, and the five-finned short achene. Furthermore, the peduncles of *S. glomeratus* are shorter and more lanate than those of *S. laticostatus*, and the involucre of the former is much more pubescent than that of the latter.

It is possible that the type specimen is a hybrid between *S. glomeratus* and some discoid species of *Senecio*, in some of which there is an approach to this type of corolla. But I have yet to encounter any species which might have contributed the unique features of the phyllaries and the achene. Furthermore, the pollen grains are well formed, lacking the abortive grains one would expect from a wide cross. I have seen no other specimen of this taxon, which in itself is suspicious, but I see no alternative to treating it as a good species, perhaps related to but certainly distinct from *S. glomeratus*.

16. SENECIO HISPIDULUS A. Rich. Sert. Astrolabe, 92, *tab 34*. 1832.

Annual herb; stem erect, simple or sparingly branched below the inflorescence, sometimes subscapose, glabrous or minutely puberulous or sometimes densely clothed with crisped multicellular hairs. Leaves 3 to 7 (to 11) cm. long, 0.5 to 1 cm.

wide (to 2.5 cm. or more in vars. *dissectus* and *scaberulus*), linear-lanceolate to ovate-lanceolate, sessile, auriculate with coarsely bidentate auricles, or the lowest leaves sometimes subpetiolate with minute linear auricles, more or less coarsely and irregularly sharp-toothed, sometimes deeply pinnatisect and the segments sharply denticulate, densely hispid beneath with multicellular hairs, less densely to sparsely hispid above or sometimes glabrate, upper surface frequently roughly wrinkled or scabrid after drying, with the hairs subtuberculate. Inflorescences terminal and axillary, corymbose, usually rather congested, sometimes diffusely paniculate, glabrous, minutely puberulous, or rarely hispid; bracts greatly reduced, sublinear or long-triangular, subentire, erect. Capitula slender, calyculate with triangular bracteoles about 1.5 mm. long and 0.4 mm. wide; phyllaries of involucre 11 to 13, 4.5 to 6 mm. long, glabrous or sparsely puberulous, not arachnoid, strongly keeled and prominently 2-nerved, scarious on the margins, acute or acuminate; corollas of the filiform pistillate marginal florets usually 4-fid, a few 3-fid or 5 fid, of the less numerous slenderly infundibuliform perfect disc florets 5-fid, the lobes all obtusely papillose-thickened on the inner aspect of the apex, the style-arm apices truncated. Achene 1.5 to 2 mm. long, plump, cylindrical, without attenuate neck but with callose-annulate apex, blackish-brown with whitish subappressed hairs in rows of variable width between the low rounded ribs. Pappus white, exceeding phyllaries, subequalling the florets.

In temperate Australia and New Zealand.

16a. Senecio hispidulus var. **hispidulus**

Senecio hispidulus A. Rich.

Erechtites hispidula (A. Rich.) DC. Prodr. 6: 296. 1838; *non* Hook. f. Fl. Tasm. 1: 220. 1860; *non* Benth. Fl. Austral. 3: 660. 1866; *non* Rodway, Tasm. Fl. 94-95. 1903; *non* Black, Fl. S. Austral. 610. 1929.

Erechthites arguta Benth. Fl. Austral. 3: 659. 1866, *pro majore parte.*

Leaves linear-lanceolate to lanceolate, denticulate to coarsely toothed, neither pinnatifid nor lobed, upper leaf surfaces scabrid with subtuberculate-based hairs. Achenes 1.5 to 1.75 mm. long, beset with hairs in narrow rows in the grooves.

Australia. tasmania: "*Senecio hispidulus* No. 18. Van Diemen, 1828, Voy. Astrolabe" (P, holotype); Port Dalrymple, *R. Brown 2278* (K); between National Park and Westerway, in railway cutting, Nov. 1929, *Comber 1756* (HO, 2; K); Knocklofty, Hobart, Dec. 1937, *Olsen* (HO); Adamsfield "in tussock of *Restio australis* in tea tree swamp, 1400 ft.", Dec. 1942, *Gordon* (HO); N. Parkside, St. Helens, Nov. 1945, *Curtis* (HO). western australia: near Perth, *Andrews 486* (K); *Smith* (K); Midland Junction, Nov. 1902, *Fitzgerald* (NSW). south australia: Lowden, South West, Oct. 1910, *Koch* (NSW). victoria: Melbourne, Brunswick, Feb. 1894, *Morrison* (K); S. E. of Oakleigh, Dec. 1895, *Morrison* (US, one piece with leaves deeply pinnatifid, approaching var. *dissectus*); Boyamp, Oct. 1896, *Morrison* (K); Midland Junction, Dec. 1898, *Morrison* (US). new south wales: Sydney, *U. S. Expl. Exped.* (US); Dec. 1902, *Camfield* (US, left-hand specimen only, right a hybrid with *S. quadridentatus*); Kiama, *Harvey* (K).

New Zealand. north island: Coromandel, *Petrie* (K, 2). south island: without specific data, ex Hb. *T. Kirk* (F). Bay of Islands, *U. S. Expl. Exped.* (US, aspect of var. *hispidulus*, but only 8 phyllaries, depauperate, leaf bases non-auriculate, leaves oblong or ovate-lanceolate).

Senecio hispidulus is a species whose identity in Australian floras has been thoroughly submerged in "*E. arguta*", while other taxa have masqueraded under its name as "*E. hispidula*".

Richard's description and figure of *S. hispidulus*, on the whole, agree well with the holotype, but erred slightly. The marginal florets are pistillate, not staminate, as pointed out by de Candolle, and are more usually 4-fid than 3-fid. The artist portrayed the leaves as entire above the bidentate auricles; actually they are rather regularly callose-dentate, as I found by use of detergent solution, but are so strongly rolled as to appear entire. De Candolle had no specimen of this taxon, but drew the diagnosis for the 'Prodromus' directly from Richard, merely correcting the description of the pistillate floret.

Hooker, however, had the misfortune to receive from Gunn, and later from other collectors on Tasmania, a curious assortment including hybrids of *S. hispidulus* with both *S. glomeratus* and *S. quadridentatus*. The former group he referred to "*E. arguta*", and attempted to treat them as varieties, as discussed above under *S. glomeratus*. The latter group he first distributed, in the "Florae Tasmaniae Spicilegium', as unnamed varieties of *E. hispidula* and *E. glabrescens* (i. e., a glabrate state of *S. quadridentatus*). Both varieties were queried as to whether they might belong to the other species!

In properly assigning Cunningham's, d'Uberville's, and his own specimens from New Zealand to *E. hispidula* in the 'Flora Novae Zelandiae', Hooker compared them to this mixed Tasmanian group: "This is also a New Holland and Tasmanian plant, but the specimens from the latter country are wooly as well as hispid. Those figured by Richard have the leaves nearly entire." This concept is epitomized by the Kew specimen, "Circular Head, 23/11/37, *Gunn 508*", which is annotated "*E. glabrescens* DC.", and beneath that, "*E. hispidula* DC.", both in Hooker's script. (Bentham rejected this determination, and cited this specimen in the 'Flora Australiensis' as *E. quadridentata* var. *glabrescens*, which it is not, either.) This specimen has the combined pubescence of *S. hispidulus* and of *S. quadridentatus* (hence, "Wooly as well as hispid"); the longer phyllaries and long and attenuate-rostrate achene of the latter; and the bidentate auricles and callose-dentate leaf margin of the former.

In the 'Flora Tasmaniae' Hooker merged his varieties of *E. glabrescens* and *E. hispidula* into what must be called *E. hispidula* Hk. f., *non* DC., and rewrote the description to fit the Tasmanian plants in his herbarium. To the Circular Head specimen he added others, which, as far as I could find at Kew, did not include a single specimen of typical *E. hispidulus* but did include the Launcestown gathering of *Gunn 508*, which definitely is *S. squarrosus*. Hooker accurately compared his New Zealand material with this Tasmanian mixture in the 'Handbook of the Flora of New Zealand': "This differs from the Tasmanian *E. hispidula* in the achene only 1/12 in. long and not attenuate at the top, also in the smaller glabrous heads and short involucral scales." He thus correctly concluded that the two groups were not conspecific, and set the New Zealand material apart as a new

species, *E. scaberula!* Actually, by direct comparison of types, *E. scaberula* and S. *hispidulus* A. Rich. are very similar and can only with some difficulty be separated into varieties.

A careful examination of the specimens determined as *E. hispidula* by Bentham for the 'Flora Australiensis' reveals that the misinterpretations initiated by Hooker were only further entrenched. I believe that all of the specimens now remaining at Kew which were determined by Bentham as *E. hispidula* are in fact not that species at all. "*Gunn 508* Circular Head," he returned to *E. quadridentata* as var. *glabrescens*. To "*Gunn 508* Launcestown" and other material of S. *squarrosus* he added other large-headed specimens collected by Backhouse and by Robertson, and called the lot *E. hispidula* (Benth., *non* DC.,). His description largely applies to S. *squarrosus*, which he included in the synonymy. He also included S. *hispidulus*, but wrote: "from the description, but scarcely the figure, t. 34." As noted above, the plate actually is in good agreement with both specimen and description.

To find S. *hispidulus* of Richard in the 'Flora Australiensis' one must look under *E. arguta*, which is described as: "more or less scabrous-hirsute with crisped hairs and occasionally with white cottony wool on the underside of the leaves and about the inflorescences, rarely nearly or even quite glabrous," and "involucre in the normal form about 3 lines long". Most of this applies to S. *hispidulus* rather than to S. *glomeratus*, and the second quotation quite excludes S. *glomeratus!* In effect, Bentham treated the S. *hispidulus* and the S. *argutus* of Richard as synonyms, although he did not realize it, having already mistakenly identified the former with S. *squarrosus*.

This confusion in *E. arguta* Benth. becomes even more obvious when Bentham's synonymy and comment are considered. *E. Bathurstiana* DC., treated as a variety of *E. arguta*, is definitely related to S. *hispidulus* instead. S. *multicaulis* A. Rich. is, by examination of the type, unquestionably part of the S. *hispidulus* complex, with phyllaries 6 mm. long and entirely glabrous, but with the achenes also glabrous instead of hairy. S. *apargiaefolius* Walp. is most likely a hybrid of S. *hispidulus* with S. *quadridentatus* (see below). S. *pusillus* A. Rich. is, from the type, definitely a hybrid between S. *glomeratus* and S. *hispidulus*, with the characters of the latter predominating, and is essentially equivalent to *E. arguta* var. *asper* Hk. f. The non-existent S. *pumilus* Poir. (*E. pumila* DC.) is an error on de Candolle's part for S. *minimus* Poir.

Rodway followed Bentham closely in his treatment of *Erechtites*. He characterized *E. hispidula* as having 16 to 24 phyllaries about 4 lines long, the capitula few and stout. This appears to be S. *squarrosus*. His *E. arguta*, with phyllaries 3 lines long or less, is certainly meant to include S. *hispidulus* as well as S. *glomeratus*. Black also included S. *hispidulus* in his *E. arguta*, but he appears to have followed Hooker in part, rather than Bentham, in applying the name *E. hispidula* to the group of specimens more resembling S. *quadridentatus* but with larger slender capitula and more numerous phyllaries.

16b. SENECIO HISPIDULUS var. **dissectus** (Benth.) Belcher, comb. nov.
Erechthites arguta var. *dissecta* Benth. Fl. Austral. 3: 659. 1866.
Erechtites Bathurstiana DC. Prodr. 6: 297. 1838.
Senecio Bathurstianus (DC.) Sch. Bip. Flora 28: 498. 1845.

Differing from the typical variety in having deeply pinnatisect leaves with obtuse sinuses, lobes 5 to 8 (to 10) on each side and broadly linear to oblanceolate, more or less acute-denticulate; marginal florets irregularly 3-fid, with one cleft or two much deeper, inner florets 4-fid.

AUSTRALIA. NEW SOUTH WALES: "Rocky Hills in the neighborhood of Bathurst", *A. Cunningham 135* (G Prodr., holotype), *A. Cunningham 102* (K, isotype?); "Rocky Hills in the country N. E. from Lachlan River", *A. Cunningham 46* (K); Hunter River, *U. S. Expl. Exped.* (US); Warrumbungle Ranges, Oct. 1899, *Forsyth* (NSW); Narrabri, Nov. 1899, *Maiden* (NSW); Capertee, Jan. 1900, *Boorman* (NSW); Brunswick River, Dec. 1903, *Maiden & Boorman* (NSW); top of Mt. Dangar, Gungal, Sept. 1904, *Boorman* (NSW); Burrinjuck, Feb. 1911, *Boorman* (NSW); Coonor's Creek, Barroba, Aug. 1913, *Rupp 6* (NSW); Bell's Paddock, Black Mountain, June 1932, *McKie 454* (NSW). VICTORIA: Wimmera, *Dallachy* (K, immature); Lake Albacutya, 1901, *D'Alton* (NSW); Goorman, Euroa, Dec. 1901 *Williamson* (NSW). SOUTH AUSTRALIA: "Austr. felix", *Mueller* (K).

Bentham's placement of *E. Bathurstiana* DC. as a variety of *E. arguta* Benth. was a logical consequence of his concept of that species as virtually identical with *S. hispidulus*. It has a much closer affinity with *S. hispidulus* proper than with *S. glomeratus*, when the pubescence and general facies are considered. It is not impossible that genetic analysis will reveal this variety as another hybrid, with *S. glomeratus* the other parent, as is suggested by the irregular corolla of the marginal floret and the addition of arachnoid pubescence on the leaf over the multicellular crisped hairs. But the general characters are closer to *S. hispidulus*, and I leave it in that species pending further study.

Croizat[37] cited this variety (as *E. arguta* var. *dissecta*) as occurring on Lombok in the Lesser Sunda Islands, without giving the authority for this record. In view of the confusion over the identity of *S. glomeratus* and of *S. hispidulus*, I hesitate to accept this extreme extension of range until I have examined the specimen.

16c. SENECIO HISPIDULUS var. **scaberulus** (Hook. f.) Belcher, comb. nov.
Erechtites scaberula Hook. f. Handb. Fl. N. Z. 157. 1864.
Senecio hispidulus Cunn. Ann. Nat. Hist. 2: 121. 1838; *non* A. Rich.
Erechtites hispidula Hook. f. Fl. N. Zeal. 142. 1853; *non* DC.
? *Erechtites pumila* Armst. Trans. N. Z. Inst. 13: 338. 1881, *fide* Kirk, Student's Fl. N. Z. 334. 1899; *non* DC.

Leaves lanceolate, the lower oblanceolate and coarsely toothed or irregularly lobed, the upper surfaces beset with coarse but non-tuberculate hairs. Achenes 2.0 mm. long, hairy in broad bands in the grooves.

I did not see Armstrong's type, cited as "McKenzie Country, *Mr. J. F. Armstrong*, December 1877".

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[37] Manual of Phytogeography. p. 538. 1952.

NEW ZEALAND. SOUTH ISLAND: Akaroa (K *ex* Hb. Hk., lectotype); Bay of Islands, 1853, *Hooker* (K, 2 sheets, syntypes); Dunedin, *Kirk 333* (US). NORTH ISLAND: "Among ferns at Wangeroo", 1833, *R Cunningham* (K); Wellington, open places, 1500 ft., 1909, *Travers* (W). Also reported by Cheeseman (l.c. 1007. 1925) from Stewart Island and the Chatham Islands.

Neither Cunningham's nor Hooker's original descriptions of this taxon gave any clue to the distinctions between it and the typical Australian variety. Hooker described it as a distinct species only on the basis of differences between it and what he mistakenly supposed *E. hispidula* to be, as described above. Since in the description of *E. scaberula* Hooker cited no specimens, but referred to his treatment of 1853, the specimens cited in the earlier work must be the syntypes. The Akaroa specimen, presumably supplied by d'Urville, is selected as lectotype because it is determined in Hooker's script as *E. scaberula*. The Cunningham specimen of this variety was not annotated by Hooker. The two sheets of Hooker's own gathering are included in the syntypes because they bear his determination as *E. scaberula*. All are in good agreement.

Dissection of a capitulum from Hooker's specimen revealed that all 18 florets contained stamens, either vestigial or functional. The lobing of the corollas also varied considerably. Most of the florets were 4-fid, some with 4 and some with 5 stamens, functional or not; two were 3-fid, one with 3 vestigial stamens, the other, non-marginal, one with 4 functional ones; only three 5-fid florets had 5 functional stamens each. No tendency toward ligules was discernible, the picture being entirely one of partial emasculation accompanied by reduction in size of corolla limb and number of lobes. This specimen thus offers an intermediate stage between the truly discoid *Senecio* with all florets perfect and infundibuliform, and the extreme erechthitoid state with all outer florets strictly pistillate and filiform. (In some other specimens, however, which also had staminodes in 4-fid marginal florets, there were some corollas with some sinuses much more shallow than others, thus approaching the ligulate condition.)

This variety appears to be confined to New Zealand, where it largely replaces the typical variety. The latter is adventive in New Zealand to some extent. The specimens from Coromandel, for example, were sent to Kew by Petrie with a note saying that they were new to the island. The determination at Kew was: "*E. scaberula* with slightly different achenes"!

SENECIO GLOMERATUS × S. HISPIDULUS

Senecio pusillus A. Rich. Sert. Astrolabe, 99. 1834.

Erechtites arguta (A. Rich.) DC. var. α Hk. f. Fl. N. Z. 142. 1853 (prob. × *S. hispidulus* var. *scaberulus*); vars. β *glabrata*, γ *aspera*, and ε., Hk. f. Fl. Tasm. Spicil. 122. 1847; Fl. Tasm. 1: 219. 1860.

Senecio glomeratus and *S. hispidulus* appear to hybridize so freely over much or all of their largely overlapping range that determination of material in this complex is exceedingly difficult. This is a situation which urgently requires investigation by as many varied techniques as can be brought to bear.

In my own determinations the following criteria have prevailed. For S. *glomeratus* I associate arachnoid pubescence, simple auricles, lanate receptacles, bracts, pedicels, and phyllary bases, small capitula, short (3.5 to 4 to 5 mm.), obscurely nerved phyllaries, usually 3-fid pistillate florets, with slightly irregular corollas, and short (1.5 mm.) brownish achenes. For S. *hispidulus* I associate hispid multicellular pubescence, with the bases of the hairs usually subtuberculate, bi-dentate auricles, glabrous or minutely puberulous inflorescence, larger capitula, longer (4.5 to 6 mm.), strongly 2-nerved, glabrous phyllaries, usually 4-fid regular pistillate corollas, and slightly longer (1.5 to 2 mm.) blackish-brown achenes.

Many specimens are intermediate in some degree in one or another or several of these characteristics, and I have felt obliged to call such specimens hybrids. If this entire complex is considered as one vast polymorphic species, which is what Bentham in effect did, one is left with the problem of appropriate subspecific categories for the many intermediate forms and the cause for such extreme variability is ignored. Hooker's reaction to contact with limited numbers of examples of these hybrid swarms was to form varieties for each; Bentham's response to a somewhat larger suite was to merge them. Later authors have largely followed Bentham.

Determination of specimens of S. *glomeratus* is further complicated by the rather extreme range of foliar variation of the species and by certain trends in the floral features as well. I strongly suspect this species of crossing rather frequently with S. *quadridentatus*, although this is much more difficult to detect because of their similarities in pubescence. I also suspect introgression, less commonly, with one or more radiate species of *Senecio*, but I am not sufficiently acquainted with these to name the probable offenders. Indeed, cursory examination of the material laid in under the several names in both the discoid and the radiate groups of Australasian *Senecio* leads me to fear that there is as much confusion of identity in those taxa as in the erechthitoid material!

SENECIO HISPIDULUS × S. QUADRIDENTATUS

Erechtites tenuiflora DC. Prodr. 6: 296. 1838.
(?) *Senecio apargiaefolius* Walp. Linnaea 14: 309. 1840.
Senecio tenuiflorus (DC.) Sieb. *ex* Sch. Bip. Flora 28: 495. 1845.
Erechtites apargiaefolia (Walp.) Sond. Linnaea 25: 524. 1852.
Erechtites Muelleri Lange, Ind. Sem. Hort. Hafn. 28. 1861; Jour. Bot. 1874: 5, *t.* 3. 1874.

The evidence of hybridization between these two species is presumptive, based on the existence of specimens intermediate in some particulars. Three related collections from Tasmania, "between National Park and Westerway, in railway cutting, 500 ft. alt., 30 Nov. 1929" (K!) are of especial interest: (1) *Comber 1756*, the first of these, is annotated: "*Erechthites arguta* DC. Tall erect perennial, 2-4 ft. high with shrubby base; whole plant green; flowers yellow". This specimen matched precisely the holotype of S. *hispidulus*. (2) *Comber 1757* is annotated: "*Erechthites quadridentata* DC. Tall erect perennial 2-6 ft. high

with a shrubby base; leaves and stems white wooly; flowers yellow". This specimen is *S. quadridentatus*, quite typical except for slightly more glabrate phyllaries than usual. (3) *Comber 1758* is annotated: "*Erechtites tenuiflora* DC. Intermediate between above numbers; 3 – 5 ft. high; involucre purple". This specimen is not quite identical with the type of *E. tenuiflora*, although the resemblance is quite close. The leaf is shaped like that of *S. quadridentatus* but is broader and auriculate at the base, although the auricle is not bidentate. The leaf is hispid above, arachnoid and hispid beneath. The stem is cottony below, glabrate above and on the inflorescence. The phyllaries are glabrate as in *S. hispidulus* but 7 to 8 mm. long, slender, and not strongly keeled. The achenes, however, are short and non-attenuate. The general aspect is that of *S. quadridentatus*, but it has several of the features of *S. hispidulus*. It is undoubtedly a hybrid, and quite possibly the offspring of numbers *1756* and *1757* themselves!

With this clearly intermediate specimen as a guide, re-examination of a large suite of specimens revealed numerous other individuals which were intermediate in various degrees in the several features in which the two species differ, and which I interpret as also being of hybrid origin.

One such hybrid, which has been dignified as a species, is *E. tenuiflora*. The type material, *Sieber* "Fl. Novae Holl. no. 435" (BM!, G!, K!, P!), shows appreciable variation among the several specimens. They agree, however, in having rather short phyllaries (6 rather than 7 to 8 mm. long), achenes of intermediate length without necks, small but definite auricles, very little arachnoid pubescence and more or less abundant hispid multicellular pubescence, features indicative of an admixture of *S. quadridentatus* with *S. hispidulus*, with the former predominating.

Another such hybrid is *E. apargiaefolia* Sonder, the type of which (Fiedler's Section, *Behr*, MEL *ex* Hb. Sond. !) was located for me by Mr. J. H. Willis. Its connection with *S. hispidulus* is shown in the auriculate leaf bases, the crisped multicellular hairs on the lower leaf surfaces beneath the arachnoid pubescence and the roughened and scabrous-haired upper leaf surface, the glabrous 2-nerved phyllaries, and the short cylindric achene. Its relationship to *S. quadridentatus* is seen in the moderately long slender phyllaries, arachnoid pubescence, narrowly lanceolate leaves, and 4-fid florets with thickened glandulose apices. It resembles *E. tenuiflora* but has a somewhat shorter achene and broader and more scabrid lower leaves.

Sonder published *E. apargiaefolia* as a new combination for *Senecio apargiaefolius* Walp., although based on a different collection. Walpers' type, cited as "Nova Hollandia Lhotsky legit", is supposed to be in Herb. Lucaeni at the Botanische Institut, of Kiel University. Although the greater part of the herbarium was saved in the destruction of the Institut during the war, it (as of 1952) was in temporary storage and inaccessible. Although Sonder stated that he compared Behr's specimen with Walper's type and found them conspecific, I have reduced *S. apargiaefolius* with a query, pending examination of the type, if it still exists.

Walper's description actually applies very well to the Behr specimen except for four points: (1) the widest leaf is only 3½ lines instead of 5 to 6, and is not repand-dentate; (2) the capitula are heterogamous, not homogamous; (3) the leaf base has small semi-clasping auricles and is not simply attenuate; and (4) the achenes are not all glabrous. The difference in leaf width may mean only that Walper's specimen is larger, or, more likely, that its leaf configuration trends more toward that of S. *hispidulus*. Walpers stated: "Flores homogami tubulosi hermaphroditi". Sonder, after examining the type, wrote: "Flores marginales feminei tubulosi!", and so transferred Walper's name to *Erechtites*. This is certainly true for the Behr specimen, and I accept it for the Lhotsky specimen until it is available for further study. Walpers possibly overlooked the auricles, which is easily done, especially if there is much arachnoid pubescence around the node. It is also possible that the Lhotsky specimen has auricles lacking or very slightly developed, for this is a very variable character. The sheets of *Sieber 435*, for example, vary among themselves from no auricles to auricles as long as 2 or 3 mm. This suggests a multiple-allelic character appearing in varying degrees, and is one of the lines of evidence in support of the hybridity of this complex.

All the achenes in the packet on the Behr specimen are definitely hairy on their ridges, after the manner of S. *hispidulus*, and are approximately 2 mm. long. Most of the achenes visible in the capitula, and all of the obviously immature ones, are also hairy. A few achenes, however, apparently the most mature ones retained, are certainly glabrous. This coincides with other observed instances, both in this genus and others, of achenial pubescence diminishing with increasing maturity. Accordingly, I accept Walper's characterization as based upon the most mature and accessible achenes and not in actual disagreement with Sonder's type.

My inquiry to Copenhagen concerning the type of *E. Muelleri* Lange went unanswered, but two sheets so determined and said to have been raised from seed from Copenhagen were included in the loan from Vienna. These agreed well with Lange's emended description and plate (1874), and may be presumed authentic. (I was unable to locate the 1861 seed list in which Lange originally published.) Their achenes ranged from 2.4 to 3 mm. long, and were heavily ribbed and only slightly attenuated. The leaves were long and rather wide, regularly denticulate to sinuate-dentate or with an occasional long-exserted linear-lanceolate tooth. The phyllaries were glabrous or glabrate, the leaves variably arachnoid, mostly glabrous above. From these features I conclude that this represents another hybrid between S. *hispidulus* and S. *quadridentatus*, essentially stabilized near the latter parental line. The relative uniformity of these plants and their immediate ancestors is not necessarily an effective argument against their hybrid nature; as pointed out by Anderson[38]: "variation between [hybrid] individuals will lessen as parental combinations are approached".

I have not cited specimens of hybrid nature, except those indicated above, for lack of space. They are, however, quite common in all the herbaria examined.

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[38] Anderson, E. Introgressive hybridization. New York. 1949.

ARRHENECHTHITES

ARRHENECHTHITES Mattf. Engl. Bot. Jahrb. 69: 288. 1938.

Perennials with shoots herbaceous or suffruticose. Capitula heterogamous with few florets. Involucre of 5 to 8 sub-biseriate phyllaries, the narrow scarious margins of the exterior ones inserted into grooves beneath the lateral nerves of the interior phyllaries. Marginal florets pistillate, as many as or slightly more than the phyllaries and opposite them; corolla filiform with base inflated and more or less indurated, oblique and truncate at the apex, minutely and irregularly toothed, or subligulate; style exserted, arms short and glabrous; achene subcylindric, with a callose rim base at the apex and also sometimes callose-annular at the base. Disc florets fewer than or as many as the marginal florets, structurally perfect but functionally staminate, corolla with limb infundibuliform, deeply 5-lobed, lobes recurved; style arms erect, short and astigmatic, or style apex subentire, papillose-hairy over the outer faces; achene narrowly cylindric or stipiform, slightly longer than that of the pistillate floret, usually with abortive embryo. Pappus filiform, white, exceeded by disc florets.

Genus characterized by functionally staminate disc florets with style arms reduced, astigmatic, and papillose over the outer faces.

Erechthitoid *Senecio* differs in having all florets fertile, perfect florets with short erect corolla lobes and style arms glabrous except for a terminal marginal fringe of papillae. *Brachyglottis* Forst. of New Zealand approaches most closely in composition of the capitulum, having marginal florets 8, opposite the phyllaries, functionally pistillate with sterile stamens; disc florets 2, apparently perfect.

Endemic in the higher mountains of New Guinea, with an extended outlier in the Australian Alps and Blue Mountains. Six species are known.

Type of the genus: *A. tomentella* Mattf.

KEY TO SPECIES OF ARRHENECHTHITES*

A. Phyllaries 5, pistillate florets 5; disc florets solitary ..... 1. *A. tomentella*
AA. Phyllaries 7 or 8, pistillate florets as many or slightly more numerous; disc florets more than one ..... B
B. Capitula 2.0 to 2.5 cm. long; achene 6 to 7 mm. long; corolla of marginal florets subligulate; medial leaves deeply pinnatifid ..... 2. *A. mixta*
BB. Capitula about 1 cm. long; achenes 2 to 3 mm. long; corolla of marginal florets minutely 3-, 4-denticulate or irregularly cleft and obliquely truncated; leaves entire or merely toothed C
C. Style of central florets scarcely bifid, clavate with shallow notch and a crown of papillose hairs; leaves 2.5 to 5 cm. long ..... 3. *A. haplogyna*
CC. Style of central florets deeply bifid, arms erect, uniformly papillose on the outer face; leaves 10 cm. long or longer ..... D
D. Leaves broadly elliptical, 10 to 15 cm. long, 4.5 to 7 mm. wide ..... 4. *A. mastigothrix*
DD. Leaves narrowly lanceolate, 15 cm. long or longer, about 3 cm. wide ..... E
E. Leaves acute, 15 to 16 cm. long; disc florets 2 ..... 5 *A. novoguineensis*
EE. Leaves caudate-acuminate, 20 cm. long or longer; disc florets 4 to 6 ..... 6. *A. dolichocephala*

*Modified from Mattfeld, Engl. Bot. Jahrb. 69:288-289. 1938.

1. ARRHENECHTHITES TOMENTELLA Mattf. Engl. Bot. Jahrb. 69:290. 1938.

Known to me only from Mattfeld's description. Apparently collected only once.

Holotype: Northeast New Guinea, "Bezirk Morobe: Sarawaket, Busu Tamunac, an offenen Grasland, 24-2700 M. ü. M.", 31 Jan. 1937, *Clemens 5251* (B, destroyed).

2. ARRHENECHTHITES **mixta** (A. Rich.) Belcher, comb. nov.

Senecio mixtus A. Rich. Sert. Astrolabe, 112, *t.36*. 1832.

Erechtites mixta (A. Rich.) DC. Prodr. 6:297. 1838; *non* Benth. Fl. Austral. 3:659. 1866; *non* Black, Fl. S. Austral. 4:610. 1929.

Stem herbaceous, erect, simple or sparingly branched, purpurascent, sparsely arachnoid. Leaves glabrous to sparsely arachnoid above, with sparse arachnoid hairs overlying numerous short strigose multicellular hairs beneath, sometimes purpurascent; lowest leaves alate-petiolate, abruptly broad-lanceolate to ovate, with large coarse teeth; medial leaves with attenuated portion progressively shorter and sinuses between teeth progressively deeper so that within 5 or 6 nodes the blade has become lobate to pinnatisect, the segments notably variable in size and shape, borne essentially at right angles to the midrib, more or less denticulate, shortly acuminate, acute, or rarely obtuse; sinuses equalling or exceeding the segments in width; leaf abruptly reduced below first node of inflorescence to a linear to ensiform bract; bracteoles of peduncle about 4 mm. long and 0.2 mm. wide. Inflorescence cymose-paniculate, much branched, lax; capitula solitary on elongate peduncles to 5 cm. long, ecalyculate but surrounded by 3 to 5 linear bracteoles 5 to 7 mm. long and 0.5 mm. wide, which arise from the terminal 2 or 3 mm. of the peduncle; end of peduncle above bracteoles abruptly doubled in diameter from 1.0 mm. to form a very short receptacle. Involucre (12 to) 20 to 24 mm. long, sub-biseriate; phyllaries long, linear-lanceolate, tightly appressed in bud, becoming widely separated in fruit or sometimes adhering tightly over the undeveloped achenes to simulate an elongated receptacle, flat-keeled, usually indistinctly 4-nerved, with mixed pubescence similar to that of leaf, often purplish, acute to acuminate, ciliolate; outer phyllaries narrower (0.71 mm.), non-scarious, frequently edged with purple; inner phyllaries wider (1.25 mm.) with light scarious margin 0.3 mm. wide on either side; intermediate phyllaries scarious on one margin, non-scarious and sometimes purple-edged on the other. Marginal florets pistillate, or having corolla with the base about 1 mm. long and 0.4 mm. in diameter, the tube 12 to 14 mm. long, 0.2 mm. in diameter, the oblique limb 1.0 to 1.5 mm. long, 0.4 to 0.5 mm. wide, and, imperfectly 2- or 3-dentate; style slender, slightly exceeding the tube; style arms divergent at an angle between 45° and 90° at full anthesis, about 0.5 mm. long, glabrous or minutely pubescent, stigmatic on the adaxial faces. Central florets 2 or 3, structurally perfect but not ripening achenes, corolla about 17 mm. long, the tube above the incrassate base slender, 14 mm. long and 0.2 to 0.3 mm. in diameter, the limb 3 mm. long and 1 mm. in diameter, regularly 5-fid with lobes deltoid, 1 to 1.25 mm. long, 0.5 mm. wide at base; anthers about 2 mm. long, 1/2 to 2/3 exserted, minutely sagittate, the terminal portion non-polliniferous and

broadly flattened, 0.5 mm. long; style scarcely exserted; style arms brief, appressed, clavate, non-stigmatic, long-papillose over all the abaxial surfaces. Achene of pistillate floret fusiform to subcylindric, callose-annulate at base and apex, 6-7 mm. long, 1 mm. in diameter in the middle, 0.5 mm. in diameter at either end, about 12-ribbed, brown, glabrous or with a single row of short slender hairs down the middle of each groove. Achene of central floret flattened, 6 mm. long, 0.2 mm. in diameter in the middle, 0.5 mm. in diameter at either end. Pappus white, scarcely barbed, subequalling florets and phyllaries.

AUSTRALIA. NEW SOUTH WALES: Port Jackson, *Gaudichaud 6* (P, holotype); Blue Mountains, *Fraser* (BM); between Blackheath and Katoomba, Dec. 1883, *Betche 56* (MEL), *Betche* (P); Fitzroy Iron Mines, Sept., *L. Atkinson 18* (MEL); Mt. Victoria, Nov. 1893, *Fletcher* (NSW); Dec. 1896, *Maiden* (NSW); Wingello, Nov. 1899, *Boorman* (NSW); Jenolan Caves, Dec. 1899, *Blakely* (NSW); Nethercote Rd., Eden, Dec. 1903, *Cheel* (NSW); Eskbank, Jan. 1915, *Hamilton* (NSW); Mt. Tomah, *Gregson* (NSW). VICTORIA: East Gippsland, spurs north of Mt. Drummer, Dec. 1937, *Hunter* (MEL); Bidwell, Feb. 1943, *Hunter 9* (MEL); Genoa Peak, Jan. 1947, *Willis* (MEL). "Australia orient.", *Hugel* (W, very meagre specimen).

Richard interpreted the subligulate marginal floret of this species as indicating a transitional form between the discoid and radiate sections of *Senecio*. He accurately described the unusual style arms of the central florets but did not recognize their uniqueness. The achenes of his specimen unfortunately were quite immature and he did not note the abortive development of those of the central florets. Mature specimens, however, show the imperfect central florets, reduced number of florets, and erect style arms with pubescent outer faces which together characterize *Arrhenechthites*. I therefore transfer Richard's species to this genus, although this requires emending Mattfeld's diagnosis to admit pistillate florets subligulate and more numerous than the phyllaries. These are minor changes when the excellent agreement in other respects is noted.

Mr. J. H. Willis has very kindly written as follows on the ecology of *A. mixta*: "It is a perennial with fleshy rooting system and bright reddish purple coloration on the stems and undersides of the leaves, and it favors well-watered stony hillsides in montane forests, from about 1000 to 4000 feet altitude." Inclusion of this species in *Arrhenechthites* extends the range of this genus, formerly known only from the higher mountains of New Guinea, by some 27 degrees of latitude.

The holotype at Paris apparently has not always been recognized as such. An original label as *S. sonchoides* A. Rich. was only corrected by an anotation by Joret in 1949! I find no explanation for the earlier epithet. The specimen, although undoubtedly in much poorer condition now than when illustrated, is certainly the one from which the plate was prepared. The plate, however, fails to show that the phyllary margins are free to the base, even though in firm contact with one another in the lower half of the involucre. Also, the corolla lobe in the detail of the pistillate florets is shown as too short. Most of the capitula shown, and some of the leaves, are now gone, apparently clipped off and distributed to other herbaria.

Very probably the leaves and capitula of this species which were admixed with the fragments of *S. squarrosus* in the packet labeled *E. Richardiana* in the Prodromus Herbarium came from this specimen at Paris. De Candolle left no specimen identified as *E. mixta* in the Prodromus Herbarium, no. 15 under *Erechtites* being omitted. The diagnosis in the 'Prodromus' is taken entirely from Richard, except for the data on number of phyllaries and length of capitulum. These he must have derived from a study of Richard's plate, for it would seem that if he had recognized the fragments mixed in with *E. Richardiana* he would have separated them, as I did, and identified them in the proper sequence.

Bentham's description of *E. mixta* resembles that of de Candolle but is original, based on *Fraser*, Piper's Hill, New South Wales (K!). This specimen is *S. runcinifolius*, as discussed above in that connection. Black's description, drawn from Bentham's, is of the same.

3. ARRHENECHTHITES HAPLOGYNA (F. Muell.) Mattf. Engl. Bot. Jahrb. 69: 292. 1938.

Senecio haplogynus F. Muell. Trans. Roy. Soc. Victoria 1:14. 1889.
Erechthites haplogyna (F. Muell.) Mattf. Engl. Bot. Jahrb. 62: 422. 1929.

Peduncle glabrate, narrowly and sharply ridged. Bracteole linear-lanceolate, 2 mm. long, subtending capitulum immediately below receptacle. Capitulum 9 mm. long, technically ecalyculate, with sub-biseriate involucre of 8 phyllaries 6 mm. long, 0.7 to 1.2 mm. wide, with about 10 narrow and sharply ridged nerves, acute, minutely ciliolate. Marginal florets 8, almost 6 mm. long; corolla 0.7 mm. in diameter at inflated base, with tube 4 mm. long and gradually tapered and indurated in lower 3 mm., apically slightly expanded, irregularly and briefly 3- or 4-fid with one sinus much more deeply cleft than the others; style exserted, coarse; style arms about 0.3 mm. long, recurved, glabrous, blunt; achene (immature) 2.25 mm. long, about 0.4 mm. in diameter. Disc florets 8; corolla 6 mm. long, infundibuliform, with inflated base indurated and 0.7 mm. in diameter, tube 3.5 mm. long and abruptly reduced in diameter to 0.3 mm. and then gradually enlarged to throat diameter of 0.5 mm., regularly 5-lobed with lobes acute and multinerved, 2 mm. long and 0.5 mm. wide; anthers 5, polliniferous, 1.75 mm. long, with bases obtuse and apices long-appendaged and narrower; style subequalling corolla lobes, almost undivided, abruptly dilated at apex to about 0.5 mm. in diameter and marginally papillose, probably non-stigmatic; achene very slender, about 2.5 mm. long and 0.2 mm. wide, immature and probably abortive. Pappus slightly tawny, barbellate, equalling phyllaries, exceeded by central florets but not by marginal ones.

Known only from a single collection in the Owen Stanley Range of New Guinea. Summit of Mt. Knutsford, 1889, *McGregor*, holotype (MEL). Material examined: A single capitulum of the holotype.

The above description is based on an examination of this capitulum after moistening it with detergent solution, and is intended only to supplement Mueller's description.

This species is quite similar to *A. novoguineensis* (S. Moore) Mattf. Indeed, in transferring Mueller's species to *Erechtites* in 1929, Mattfeld stated that they might be identical. Later, in transferring them both to *Arrhenechthites*, he kept them separate on the basis of a difference in leaf size. I at first supposed that the species named by Moore might simply be based on a more luxuriant shade form of Mueller's plant, a supposition gaining some support from ecological data in the two reports. After comparing the florets from the two types, however, I believe that the following differences in floral characteristics reinforce the imperfectly known vegetative differences:

	A. haplogyna	*A. novoguineensis*
Central florets	8, with corolla lobes 2 mm. long, 0.4 mm. wide	2, with corolla lobes 1.5 mm. long, 0.35 mm. wide
Corolla tube of marginal florets	Rigidly incrassate, gradually tapering for about ¾ its length	Rigidly incrassate for about ¼ to ⅓ its length and abruptly reduced in diameter
Achene	Apparently about 2.5 mm. long when mature	About 2 mm. long
Style-arm apex	Extremely short, almost undivided, and abruptly dilated	0.42 to 0.45 mm. long, little or not at all dilated

4. ARRHENECHTHITES MASTIGOTHRIX Mattf. Engl. Bot. Jahrb. 7: 477. 1940.

Known to me only from Mattfeld's description. Apparently collected only once so far. This is the only one of the species of this genus for which Mattfeld explicitly stated: "Typus in Herb. Berol.".

Holotype: New Guinea, Saruwaged Mts., Masak river, am Wasser, 1800-2400 meters, 10 Nov. 1937, *Clemens 7509* (B, destroyed).

5. ARRENECHTHITES NOVOGUINEENSIS (S. Moore) Mattf. Engl. Bot. Jahrb. 69: 292. 1938.

Erechthites novoguineensis S. Moore, Trans. Linn. Soc. 9: 86. 1916.

Marginal florets pistillate, 8 to 10; corolla base inflated and indurated, abruptly softened and reduced in diameter, tube slender, obliquely truncate or irregularly briefly toothed. Central florets 2, with 5 corolla lobes 1.5 mm. long, 0.35 mm. wide; anthers polliniferous; style scarcely exserted, arms only 0.42 to 0.45 mm. long (rather than 1 mm., as given by Moore) and slenderly clavate, nonstigmatic, and papillose-hairy on the abaxial sides only.

Apparently known only from the type collection from northwestern New Guinea.

Holotype: New Guinea, Nassau Mountains, Carstensz Peak, 6551 to 7956 ft., 27 Jan. 1913, *Boden-Kloss* (BM!).

The holotype, and only, specimen is a small fragment, consisting of a short apical length of stem with two main leaves, their axillary (and flowering) bran-

ches, the large terminal corymb, and an additional large leaf (detached). It agrees well with the generic characterization as given by Mattfeld for *Arrhenechthites*, especially the structure of the capitulum, except for one minor detail. Whereas Mattfeld specified that the marginal florets should be of the same number as the phyllaries and opposite them, the marginal florets in this specimen number from 8 to 10 per capitulum, whereas the number of phyllaries is 8. As pointed out in the discussion of *A. mixta*, there is also in that species an excess number of marginal pistillate florets, for the accomodation of which I have slightly expanded the generic limits. It appears that Mattfeld did the same by implication when he included Moore's species in the new genus. The supplementary description given above deals only with the finer structure of the capitulum, which was inadequately treated by Moore.

6. ARRHENECHTHITES DOLICHOCEPHALA Mattf. Engl. Bot. Jahrb. 69: 289. 1938.

Known to me only by Mattfeld's description. Apparently not again collected.

Holotype: Northeast New Guinea, "Bezirk Morobe, Sarawaket, Busu Tamunac, an offenen Stellen," 2100 to 2400 m., 30 Jan. 1937, *Clemens 5287* (B, destroyed).

SPECIES TO BE EXCLUDED FROM ERECHTITES

In addition to the Australasian species of *Erechtites* which I have placed in an erechthitoid group of *Senecio*, and the three species referred to *Arrhenechthites*, six other taxa have been described as *Erechtites* which do not belong to that genus. One is a *Blumea*. The other five belong in *Senecio;* one is erechthitoid, one is radiate, and three are discoid. These six are discussed here. In addition, a seventh name, a *nomen nudum*, is shown to be based most probably on still another discoid *Senecio*.

BLUMEA TENERA Merr. Philip. Jour. Sci. Bot. 7: 250. 1912.

Erechthites Bukaensis Rech. & Muschl. in Rech. Denkschr. Akad. Wiss. Wien 89: 620. 1914.

Rechinger 4043 (W!), syntype of *E. Bukaensis*, has a pluriseriate involucre, caudate anthers, and other features of the tribe Inuleae, genus *Blumea*. Among the Indonesian sheets of *Blumea* at Kew was an undetermined sheet from the Solomons and two sheets from the Philippines which agreed with the Rechinger specimen in fullest detail. The Philippine sheets included *Merrill 7363*, isotype of *Blumea tenera*, and agreed fully with the description. This species is now seen to have a wide, if spotty, distribution from Luzon to the Solomons. It appears to be a low-growing member of the rank-grass or "cogonal" association. Further search in such habitats should reveal additional stations.

PHILIPPINE ISLANDS. LUZON: Prov. Rizal, between La Loma and Maypajo, near Manila, Dec. 31, 1910, "in open grasslands a few meters above sea-level, not common", *Merrill 7363* (K, isotype of *Blumea tenera* Merr.); Palawan, Taytay, May 1913, *Merrill 9397* (K). NEW GUINEA: "am Ramm Fluss", Jan. 1902, *R. Schlechter 13900* (K). SOLOMON IS.: Buka, "in Alang-Alang (*Imperata*)", Sept. 1905, *Rechinger 4043* (W, syntype of *E. Bukaensis*); New Pomerania, Simpsonhafen, Sept. 1905, *Rechinger 4205, 4267* (W, both det. as *E. prenanthoides* DC.).

Merrill also cited "*Merrill 679* from Culion, and *For. Bur. 5874 Curran*, from Zambales Province, Luzon, both small forms", but I have not seen them. In addi-

tion, *Rechinger 4044*, from the same station as *Rechinger 4043*, the other syntype of *E. Bukaensis*, is most probably *B. tenera* also, but I have not seen the specimen, which is at Vienna.

SENECIO LEPTANTHUS Phil. Anales Univ. Chile 88:15. 1894; *emend.* Reiche, Fl. Chile 4: 225-226. 1905.

Erechthites leptantha (Phil.) Cabr. Not. Mus. La Plata 14 (Bot. No. 69): 75-78. *fig. 1.* 1949.

CHILE: Prov. Antofagasta, Taltal, Oct. 1925, *Werdermann 825* (K, 2); Desert of Atacama, 1890, *Morong 1292* (K).

I have not seen Philippi's type (*Geisse*, near Caldera). The specimens cited above, however, agree with his description except for the achenes, which are very densely clothed with short blunt white hairs, rather than glabrous. This is reconciled by Reiche: "Aquenios cortamente blanco-peludos (no peludos, como se dice en la diagnosis original.)" Cabrera also describes the achenes as "densa y cortamente papiloso-pubescentes".

In *Werdermann 825* the first row of marginal florets was filiform and pistillate, those of the second row functionally pistillate but with rudimentary stamens, and those of the third and subsequent rows perfect with functional stamens. *Morong 1292* had some florets in the outermost marginal row with rudimentary stamens and others without, while those in the second and subsequent rows were all functionally perfect. Of more importance, all of the specimens agreed as to style-arm apices. The tips of the style arms in the marginal florets were blunt, without dorsal protruding papillae. In the perfect florets the style-arm apices were sharply truncate with a half-crown of moderately enlarged but non-fused papillae fringing the apex (cf. Cabrera, *fig. 1-H*).

Cabrera transferred this species to *Erechtites* because of the pistillate filiform marginal florets. In view of the lack of the appendage of fused papillose hairs which characterizes *Erechtites*, I believe it better to return this species to *Senecio*. In structure and size of capitula it strikingly resembles erechthitoid species of *Senecio* in Australasia. This resemblance is reinforced by the unusual velutinous achene, quite like that of certain Australian species, which is so very different in shape, size, ribbing, color, and pubescence from the distinctive achene of the genus *Erechtites*.

SENECIO **glossanthus** (Sond.) Belcher, comb. nov.

Erechtites glossantha Sond. Linnaea 25:524. 1852.

Senecio brachyglossus F. Muell. *ex* Benth. and var. *major* Benth. Fl. Austral. 3:670. 1866; *excl.* var. *elatior* Benth. l. c.; *non S. brachyglossus* Turcz. Bull. Soc. Nat. Mosc. 24^{II}: 87. 1851.

Annual; stem erect, 20 cm. tall, sparingly branched above, glabrate, faintly striate, purplish below. Leaves 2 mm. broad at the base, alate, broader toward apex, bearing on either side one or more narrow lobes at an angle of from 45° to 60° and approximately 5 times as long as wide, their width being about one-half that of the rachis, the margins all minutely and irregularly callose-denticulate, glabrate or with occasional long coarse isolated hairs, especially along the nerves

beneath, lower leaves sessile and neither auriculate nor clasping. Upper leaves similar to the lower but more lobate and smaller, with base auriculate and semi-amplexicaul. Inflorescence compactly cymose, capitula rather few, peduncles short, primary floral bracts equaling or exceeding the branches. Involucre of 8 to 10 (to 12) phyllaries 4 to 6 mm. long, inconspicuously 2- to 4-nerved, with margins scarious and apex acute, sphacelate and minutely papillose; calyculus of 6 to 8 broadly lanceolate short bracteoles, 1.5 to 2 mm. long and 0.5 to 0.6 mm. wide, margins laciniate, apex sphacelate; peduncles long-haired in the axils. Marginal florets few, ligulate, pistillate, without rudimentary stamens; corolla tube slender, 2.5 to 2.75 mm. long, 0.25 mm. in diameter, 4-nerved; ligule up to 2 mm. long and 0.5 mm. wide, 2-nerved, lanceolate, apex acute, revolute; style arms ca. 1 mm. long, bluntly truncate or slightly rounded on apex, without encircling papillae, exserted. Disc florets perfect, about 25; corolla very slenderly infundibuliform, 4 mm. long, 0.4 mm. in diameter, minutely and regularly 5-fid, teeth about 0.3 mm. long; style arms about 1 mm. long, not exserted, apices slightly rounded, marginally papillose. Achene 2 to 2.5 mm. long, very densely clothed with appressed tawny hairs about 0.5 mm. long which completely conceal the slender achene and extend beyond its apex. Pappus white, capillary slightly exceeding phyllaries.

AUSTRALIA. S. AUSTRALIA: "ad litus sinus St. Vincent", *Mueller* (MEL, syntype); Mt. Lyndhurst, Sept. 1898, *Koch 220* (K). VICTORIA: Aug. 1843, *Robertson 468* (K); Melbourne, 1854, *Adamson 342* (K); Point Nepean, *Mueller* (K, syntype of *S. brachyglossus* var. *major*). WESTERN AUSTRALIA: Swan River, *Drummond 44* (K); *Drummond 377* (K); Klondinin, Sept. 1932, *Young* (K).

This briefly ligulate and rather variable species bridges the gap between erechthitoid species with irregular corollas in the marginal florets and definitely ligulate eusenecionoid species. It was assigned to *Erechtites* section PLAGIOTOME by Sonder, despite his description, "ligulis stylum aequantibus vel superantibus." This might indicate that he also felt the vagueness of the boundary between *Senecio* and the Australian species assigned to *Erechtites*. Sonder described the capitulum as 3 lines long with about 12 phyllaries and 20 to 30 florets. Bentham described *S. brachyglossus* as having capitula 2 lines long with about 8 phyllaries and 16 to 18 florets, and then wrote: "var. (?) *major*. Flower-heads larger. Involucres about 3 lines long with about 12 bracts. Florets also more numerous." Thus var. *major* agrees exactly with Sonder's description of *E. glossantha*.

The syntype from St. Vincent's Gulf has phyllaries 6 mm. (3 lines) long, as stated by Sonder, but the number ranges from 8 to 10, usually 9, and never reaches 12. The other syntype collection by Mueller, cited by Sonder as "ad agros prope urbem Adelaide", may be the specimen cited by Bentham for his typical variety as "near Adelaide, *F. Mueller*". If so, it probably has 8 phyllaries 4 to 5 mm. long, as do the other specimens at Kew which Bentham determined as typical *S. brachyglossus*. The Pt. Nepean specimen, cited by Bentham for var. *major*, agrees exactly with the one from St. Vincent's Gulf except that it does have 12 phyllaries. *Drummond 377*, cited by Benthan for var. *major*, differs from both the above in having

only 8 phyllaries, much broader leaves, and the corolla merely obliquely truncated, but since the achene is characteristically pubescent I consider it a variant of S. *glossanthus*. The Wilson Promontory specimen is to be excluded from the species altogether, as it had a bifid ligule 2.5 mm. long, a glabrate achene with an oblique annulus, and leaves with broadly amplexicaul bases. Thus Bentham's var. *major* is based on a mixture of unrelated elements and should not be maintained.

I conclude that *Senecio glossanthus* is best interpreted as a variable species distinctively characterized by it unusually hairy achene. The variation of the phyllaries from 8 to 12 in number, and from 4 to 6 or 7 mm. in length, may be an edaphic response, which would make it unwise to make varietal distinctions without further information.

Bentham also published a var. *elatior*, based on a specimen from the Blue Mountains. The type specimen at Kew and isotypes sent from Melbourne and Sydney agree in having the ray florets with a trifid ligule only 1 mm. long, 10 to 12 phyllaries, and a leaf much larger and more dissected than that of S. *glossanthus*. In addition, their achenes are distinctively different in size, shape, and pubescence from those of S. *glossanthus*. Var. *elatior* is to be excluded from this species.

SENECIO GEORGIANUS DC. Prodr. 6: 371. 1838; *non* Greenm. Ann. Mo. Bot. Gard. 25: 803. 1938.

Erechtites candicans Hook. f. Lond. Jour. Bot. 6: 122. 1847.

Hooker did not specify a type in his description of *E. candicans*, stating merely: "Hab.? (*Gunn* in Herb. Hook.)". There is a sheet at Kew from Hooker's herbarium on which the right-hand specimen bears the following annotation: "Van D[ieman's] L[and], Gunn", "*Erechtites candicans* nob." (in Hooker's script), and "701. *Senecio Georgianus* DC.". I take this to be the holotype, and it agrees with the description given by Hooker. Dissection of a capitulum at the bud stage showed it to have marginal florets 5-fid with polliniferous stamens; that is, it is a discoid rather than an erecthitoid *Senecio*. Comparison of this specimen with both the isotype (K!) and the holotype (G!) of S. *georgianus* DC. shows them to be conspecific, as later concluded by Hooker and as given in the 'Index Kewensis'.

Senecio georgianus Greenm. was published as a new name for S. *Hallii* Hieron., 1895, *non* Britton, 1889. Apparently Greenman overlooked the anterior Candollean name. Britton's plant was from Wyoming, Hieronymus' from South America. As far as I am aware, the latter still requires re-naming, but that I leave to students of *Senecio* of South America, if indeed they have not already done so.

SENECIO POLYPODIOIDES (Greene) Greene *ex* Greenm. Monogr. Senecio, T. 1: 25. 1901; Engl. Bot. Jahrb. 32: 21. 1902.

Senecio polypodioides Greene, Pittonia 3: 90. 1896, *nom. prov.*

Erechtites polypodioides Greene, Pittonia 3: 90. 1896, *nom. nov.* for S. *gracilipes* Robins. & Greenm.

Senecio gracilipes Robins. & Greenm. Amer. Jour. Sci. 50: 156. 1895; *non* A. Gray, Proc. Amer. Acad. 5: 142. 1862

Senecio polypodioides Robins. & Greenm. *ex* Jacks. Ind. Kew. Suppl. 1:393. 1906, error.

The isotype at Kew has functional stamens in all florets and belongs in *Senecio*, section MULGEDIIFOLII, where Greenman finally placed it.

Type: Mexico, State of Oaxaca, Sierra de Clavellinas, 9000 ft., 24 Oct. 1894, *Pringle 6010* (GH; K!).

SENECIO RUNCINATUS Less. Linnaea 6: 410. 1831.

Erechtites ? runcinata (Less.) DC. Prodr. 6: 295. 1838.

This species has uniformly homogamous capitula. Not one filiform pistillate floret was found among several hundred florets which I examined from scores of heads from many different specimens (K, BM, P, G, W, MICH). The style-arm apices are truncated, with a lateral whorl of stubby pollen-presentation papillae but with no terminal tuft of fused hairs such as characterizes the genus *Erechtites in sensu strictiore*. This species is, in fact, a discoid *Senecio*, section MULGEDIIFOLII. Its delimitation and synonymy will be treated in a separate publication.

Type: Mexico, Vera Cruz, "Malpays de la Joya, Novbr.", *Schiede & Deppe* (B, destroyed).

ERECHTITES ELONGATA A. Gray *ex* Jacks. Ind. Kew. 2: 860. 1893, *nomen nudum*; DC. Prodr. 6: 294, 1838, *nomen nudum*.

As pointed out in the discussion of *Erechtites*, this "*E. elongata*", in the light of Rafinesque's letter to de Candolle, refers most probably to *Senecio elongatus* Pursh, Fl. Am. Sept. 2: 529. 1814. This was treated by Torrey and Gray as a discoid form of S. *aureus* var. *obovatus* Torr. & Gray, and now appears in 'Gray's manual' (8th ed.) as S. *obovatus* forma *elongatus* (Pursh) Fern. It is as unrelated as possible to *E. hieracifolia*.

At least four other names have been published in *Erechtites* as *nomina nuda*. These are: *E. senecioides* Turcz. (Bull. Soc. Nat. Mosc. 24: 201. 1851), probably an error for *E. sonchoides*, as explained on page 48; *E. macroglossa* Muell. (Rept. Gov't. Bot. 1853, p. 15. 1853), entirely unidentified; and *E. pauciflora* and *E. uniflora* Raf. (Herb. Raf. 68. 1833), both of which most probably were applied to depauperate forms of typical *E. hieracifolia*.

Index to Scientific Names

Previously published valid names are in ordinary type; new names and the final members of new combinations are in **bold face** type; synonyms are in *italics*.